Tag Program and Leash Regulations on Open Space and Mountain Parks Lands

Monitoring Protocol

Prepared by:
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Ruth Magtanong, Visitor Use Technician

June 2015

City of Boulder
OPEN SPACE & MOUNTAIN PARKS

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Voice and Sight Dog Tag Program and Leash Regulations Monitoring Protocol: 2014-2018

1.0 Background

The Voice and Sight Dog Tag Program (Tag Program) is a management strategy within the Education and Outreach, Safety and Enforcement, Recreation Opportunities and User Conflict Reduction Initiatives of the Visitor Master Plan (City of Boulder 2005). Under the Tag Program, launched in the summer of 2006, visitors wishing to manage their dog(s) off-leash and under voice and sight control are required to have a voice and sight tag visibly displayed on their dogs. To obtain a voice and sight tag through 2014, an applicant must view a video describing the requirements of voice and sight control, acknowledge understanding of those requirements and complete a registration form. Beginning in January 2015, participants will also be required to attend an hour-long in-person Tag Program training session. Visitors not registered in the program or who do not have a voice and sight tag on their dog must keep their dog on-leash while visiting Open Space and Mountain Parks (OSMP) and other City of Boulder properties where voice and sight control is a designated option. Tag Program success is important to maintain quality visitor experiences and for protection of resources as OSMP receives about 2 million annual dog visits (Vaske, Shelby & Donnelly 2009).

Previous monitoring conducted before (2006), immediately after (2007) and almost four years after (2010) the program's launch, as well as other sources of information, indicate that the program achieved some but not all of the original objectives (City of Boulder 2011). In collaboration with the public and appointed advisors, OSMP has developed a number of Tag Program enhancements designed to improve the program and increase understanding of and compliance with Tag Program requirements. The current monitoring project is scheduled to be conducted before, soon after and three years after implementing Tag Program enhancements to gain an understanding of any measurable change in observed behaviors.

A glossary of terms used within this protocol as defined for this monitoring project is contained in **Appendix A**; "voice and sight control" is also defined below.

Boulder Revised Code (B.R.C.)-definition of voice and sight control
B.R.C. 6-1-2. Definitions
"Voice and sight control" means the ability of a guardian or keeper to adequately control a dog by using voice commands and sight commands (such as hand gestures). In order for a guardian or keeper to have voice and sight control over a dog, the guardian or keeper must: (1) be able to see the dog's actions; and (2) be able to prevent the dog from engaging in the following behaviors, using voice and sight commands, without regard to circumstances or distractions:

(a) Charging, chasing, or otherwise displaying aggression toward any person or behaving toward any person in a manner that a reasonable person would find harassing or disturbing;

(b) Charging, chasing, or otherwise displaying aggression toward any dog;

(c) Chasing, harassing, or disturbing wildlife or livestock; or

(d) Failing to come to and stay with the guardian or keeper immediately upon command by such person.

2.0 Project Goal and Objective

The overall goal of the enhanced Tag Program is to:

Increase the proportion of dog guardians visiting OSMP who have control over their dogs as required by applicable regulations including proof of current dog rabies vaccinations to maintain a safe, high-quality visitor experience for all and for the conservation of natural resources.

The Tag Program enhancements project objective relevant to this monitoring study is:

Increase compliance with observed dog regulations and voice and sight control rules.

3.0 Monitoring

Effectiveness monitoring (City of Boulder 2005) is proposed to determine whether the Tag Program is achieving the project objective. The effectiveness monitoring associated with the Tag Program objectives consists of two components which are Voice and Sight Regulations and the Leash Interview. The effectiveness monitoring will be implemented in the spring/summer of 2014 prior to the implementation of Tag Program enhancements and again in 2015 following implementation of program enhancements. A third monitoring period scheduled for 2018, approximately three years after implementation of Tag Program enhancements, is proposed. During the second and third monitoring periods, the interview component described below will not be conducted if leash compliance within voice and sight areas is determined to be at an acceptable level following the first monitoring period.

The phrase "dog-containing visitor party", as included in any Voice and Sight Regulations or Leash Interview Components section of this protocol, is defined as any visitor party with one or more dogs being managed under voice and sight control (off-leash).

The Voice and Sight Regulations Component monitoring will consist of two discreet phases. During phase one, field technicians will be collecting data at various monitoring sites using predetermined codes and definitions. During phase two, the project team, along with monitoring and ranger staff, will review field data for the more subjective components of the regulations (B.R.C. 6-1-2. Definitions, a-d) to evaluate and interpret each visitor party's chronologically recorded data.

The evaluation team, using the language within the definitions of section 6-1-2 of the B.R.C. and **empathic neutrality**[1], will determine whether or not each visitor party is considered compliant with these more subjective components of voice and sight regulations. Because dog control is context-dependent and situational, each visitor party will be evaluated and interpreted using only the data collected for that party. Evaluators will attempt to remain as neutral as possible when interpreting each party's data.

Additional measures of dog regulation compliance *not specific to the Tag Program* will be monitored during the study period. These two additional components include dog excrement removal and leash compliance on both non-seasonal and seasonal leash-required trails. These measures were added to this project based upon direction received from the Open Space Board of Trustees (OSBT) and project team staff.

3.1 Voice and Sight Regulations Component of the effectiveness monitoring is a naturalistic observation study designed to evaluate dog guardian compliance with observable aspects of specific dog regulations of the voice and sight ordinances. During field monitoring, data will be collected to describe visitor party attributes, dog behaviors and guardian responses. These descriptive field data will be evaluated and interpreted in the office using all of the collected information for each party to provide context and a chronological understanding of each party's recorded behaviors and interactions. Evaluation and interpretation will be conducted by the monitoring staff along with project management and ranger staff to determine a compliance outcome for each visitor party.

While monitoring for this component, staff will use the indicators listed below to describe **events**. These events can include passes, interactions, commands given or out of sight occurrences. A pass occurs when an "other" (human, dog, livestock, wildlife) is in proximity of the visitor party but no interaction occurs. An interaction occurs when a defined behavior of either the visitor party or the "other" is observed. Each visitor party has the potential for multiple passes and interactions while in the field of view of the observer. Some indicators recorded for each visitor party will only be counted once, such as the number of visible tags on off-leash dogs. Other indicators will be counted as many times as they occur, such as the number of calls made by the guardian per visitor party while in the field of view. Compliance with V/S regulations, however, will only be counted once per visitor party when determining the overall compliance rate for the Tag Program. Any non-compliant event that occurs while a visitor party is within view of the observer will result in a non-compliant outcome for that party in the overall compliance rate measure.

There are two sampling objectives associated with the Voice and Sight Regulations Component.

3.1.1 Sampling objective 1

Sampling objective 1: Estimate the proportion of visitor parties with one or more dogs under voice and sight control (off-leash) that comply with *all* observed voice and sight control regulations, collectively, with a 95% confidence level that population estimates are within ±5% of the estimated true value

[1] A distinctive characteristic of qualitative researchers who strive to be nonjudgmental when compiling findings.

Indicators to observe in field
Number of

- Visitor parties with at least one dog off-leash
- People per visitor party
- Dogs per visitor party
- Dogs off-leash without a Tag Program tag visibly displayed on the dog
- Dogs off-leash with unknown tag display (observer unsure)
- Visitor parties with at least one dog out of their guardians' sight
- Visitor parties with more than two dogs off-leash per guardian
- Visitor parties with one or more dogs that enter an off-trail area closed to visitor access such as a seasonal wildlife closure or a dogs-prohibited area
- Dog interactions by interaction type
- Dog responses by interaction type (**Appendix B**)
- Guardian responses by interaction type

Statistics

Frequency data
These statistics will be calculated for all observations. Each of these measurements will be calculated once at the visitor party level, and some will include the relative frequency calculated by comparing the occurrence of each to the total number of visitor parties.

- Number of visitor parties with at least one dog off-leash
- Number of parties with 1, 2, 3, etc. people per party (by integer)
- Number of parties with 1, 2, 3, etc. dogs per party (by integer)
- Number of parties with unknown tag display
- Number of visitor parties with a tag displayed on all off-leash dogs
  - Compliance requires a tag to be visibly displayed on all off-leash dogs
- Number of visitor parties with all dogs within sight
  - Compliance requires the dogs in a visitor party to be within the immediate 360^{o} field of view of the guardian(s) at all times.
- Number of visitor parties with no more than 2 dogs off-leash per guardian
  - Compliance requires that there is no more than $2x$ dogs off-leash per party; where x is the number of people in the party.
- Number of visitor parties in which one or more dogs enter an off-trail area closed to visitor access

Evaluation outcomes
These statistics will be calculated at the visitor party level (i.e. including observations with no interaction observed) and/or at the event level based upon the data type.

- Proportion of visitor parties which comply with *all* observed voice and sight regulations (overall compliance rate)
  - The overall compliance rate will be calculated using the results from all the individual regulation categories measured. Any one non-compliant category for a visitor party will cause that party to be determined as non-compliant for the purpose of calculating the overall compliance rate.

- Proportion of visitor parties which comply with *each* observed voice and sight regulation
- Proportion of visitor parties who fail to comply with the regulation prohibiting their dog from charging, chasing or other displays of aggression toward a person
    - Compliance means that a dog does not charge, chase, or otherwise display aggression
        - Charge/chase/display aggression is determined by a combination of the dog's behavior, the other's response, and the guardian's actions.
- Proportion of visitor parties who fail to comply with the regulation prohibiting their dog from charging, chasing or otherwise displaying aggression toward any dog
    - Compliance means that a dog does not charge, chase or otherwise display aggression toward any dog
        - Charge/chase/display aggression is determined by a combination of the dog's behavior, the other dog's behavior and the guardian's actions.
- Proportion of visitor parties who fail to comply with the regulation prohibiting their dog from chasing, harassing or disturbing livestock or wildlife
    - Compliance means that a dog does not chase, harass or disturb livestock or wildlife
        - Chase/harass/disturb is determined by a combination of the dog's behavior, wildlife or livestock response and the guardian's actions.

Ancillary statistics
Number of
- Parties with one or more leashed dogs
- Types of others passed by person, dog, livestock and wildlife

3.1.2 Sampling objective 2

Sampling objective 2: Estimate the full range of guardian and dog response patterns and commands given to dogs being managed under voice and sight control; estimate with a 95% confidence level and no greater than ± 5% of the estimated true value, the proportion of guardians meeting the voice control requirement. Dog control is context dependent/situational and determining the range of behavioral patterns is necessary to evaluate verbal and sight compliance.

Indicators to observe
Number of
- Number of dog behaviors by code and by occurrence
- Guardian responses by code
- Visitor parties who issue one or more V/S commands to their dog
    - Issue a V/S command means that the guardian spoke an audible command to the dog with their voice; issued commands may also include other signals (including but not limited to vocalizations [words, whistles, whoops, etc.], clapping, or by making noises with their person or a device, or by motions, movements or positions of their person); ***and***
      That the signal appeared to the observer to be communication intended to establish control of the dog including but not limited to gaining the dog's attention and/or requiring the dog to stop or return to the guardian.
        - Intended to establish control means that the guardian spoke discreet commands such as "come here" and that the direction of movement of the guardian, tone of voice and/or rate of speech used by the guardian is more urgent or stern than a

friendly or relaxed behavior or tone would be.

- Dog responses to guardian by behavior code
- Visitor parties who issue other commands to their dog
    - Issue an other command is defined as above in V/S commands except the command is not definitively related to V/S or intended to establish control; other commands include things such as just the dog's name or the word "hey!"

Statistics

Frequency data
Each of these measurements will be calculated once at the visitor party level and/or at the event level based upon the data type.

These statistics will be calculated for all observations.

- Number of visitor parties who issue one or more commands to a dog
- Number of dog behaviors by code
- Number of guardian responses by code
- Number of dog responses by behavior code

Evaluation outcomes
These statistics will be calculated both for all observations (i.e. including observations with no interaction observed)

- Proportion of visitor parties which issue one or more V/S command that are successful in managing their dog using voice and/or sight commands (in compliance with the voice and sight control regulations)
    - Compliance means that the guardian was successful in using voice or sight commands to prevent or stop the dog from behaviors prohibited in the B.R.C. and/or obtaining the desired behavior from the dog as exhibited by the command given

Ancillary statistics
Number of

- Other communications not associated with V/S regulations between guardians/dogs (e.g. only dog's name)
- Dog responses to guardian by behavior code

3.2 Leash Interview Component of the effectiveness monitoring is a visitor interview. During the interview, each guardian with one or more off-leash dogs will be asked to participate in a demonstration that the guardian possesses a leash for each dog they are managing under voice and sight control. The interview is designed to evaluate dog guardian compliance with the leash possession regulation. There is one sampling objective associated with the Leash Interview Component.

3.2.1 Sampling objective 1

Sampling objective 1: Estimate the proportion of visitor parties with one or more dogs being managed under voice and sight control that comply with the leash requirement of the voice and sight ordinance with 95% confidence levels that population estimates are no greater than ± 5% of

the estimated true value.

Indicators to observe
Number of

- People per visitor party
- Dogs per visitor party
- Visitor parties with at least one dog off-leash
- Visible leashes
- Visitor parties in possession of a leash for each off-leash dog in their party
    - In possession means that the observer determined that the visitor party had a leash for each off-leash dog by directly observing the leashes on the guardian or backpack of the guardian or that the guardian had the correct number of leashes when asked to show them or a combination of the above
- Dogs with and without a Tag Program tag visibly displayed on the dog
- Dogs with unknown tag display (observer unsure)

Statistics

Frequency data
This statistic will be calculated for all observations. Each of these measurements will be calculated once at the visitor party level, and the relative frequency calculated by comparing the occurrence of each to the total number of visitor parties.

- Number of visitor parties in which the guardian(s) has a leash for each off-leash dog in the party

3.3 Dog Excrement Component of the monitoring is an observational study designed to evaluate dog guardian compliance with dog excrement removal regulations. This component is not designed or intended to measure Tag Program compliance and is included in this project based upon direction received from the Open Space Board of Trustees (OSBT) on July 10,2013. There is one sampling objective associated with the Dog Excrement Component.

3.3.1 Sampling objective 1
Sampling objective 1: Estimate the proportion of visitor parties with one or more dogs under voice and sight control that comply with the excrement removal regulations with a 95% confidence level that are no greater than ± 5% of the estimated true value.

Indicators to observe
Number of

- Excrement events
- Visitor parties who immediately pick up and/or bag all excrement
- Visitor parties who properly dispose of or take with them all excrement bags

Statistics

Frequency data
This statistic will be calculated for all observations.

Each of these measurements will be calculated once at the visitor party level, and the relative frequency calculated by comparing the occurrence of each to the total number of visitor parties.

- Proportion of dog-containing visitor parties in which the guardian(s) immediately pick up and properly dispose of or take with them all excrement left by a dog under their control

3.4 Leash Required Component

Operationally, the seasonal and year-round monitoring periods will be conducted separately. In analysis, these two components may be collapsed.

Seasonal Leash Component of the monitoring is an observational study designed to evaluate dog guardian compliance with seasonal leash laws on designated trails. There is one sampling objective associated with the Seasonal Leash Component.

The phrase "dog-containing visitor party", as included in any Seasonal Leash Component section of this protocol, is defined as any visitor party with one or more dogs.

3.4.1 Sampling objective 1

Sampling objective 1: Estimate the proportion of dog-containing visitor parties that comply with the seasonal leash laws on designated trails with 95% confidence level that are no greater than ± 5% of the estimated true value.

Indicators to observe

Number of

- Visitor parties with at least one dog
- People per visitor party
- Dogs per visitor party
- Visitor parties who have each dog under their control on-leash while visiting a seasonal leash-required designated trail
- Dogs with and without a Tag Program tag visibly displayed on the dog
- Dogs with unknown tag display (observer unsure)

Statistics

Frequency data

These frequency data will be calculated for all observations.

- Number of visitor parties with at least one dog
- Number of parties with 1-n people per party (by integer)
- Number of parties with 1-n dogs per party (by integer)
- Number of parties with and without a Tag Program tag visibly displayed on the dog
- Number of parties with unknown tag display
- Number of dog-containing visitor parties in which the guardian(s) have each dog under their control on-leash while visiting a seasonal leash-required designated trail
    - Proportion on-leash with and/or without a Tag Program tag visibly displayed on the dog

Year-round Leash Component of the monitoring is an observational study designed to evaluate dog guardian compliance with non-seasonal leash laws on designated trails. There is one sampling objective associated with the Non-seasonal Leash Component.

The phrase "dog-containing visitor party", as included in any Year-round Leash Component section of this protocol, is defined as any visitor party with one or more dogs.

3.5.1 Sampling objective 1

Sampling objective 1: Estimate the proportion of dog containing visitor parties that comply with the non-seasonal leash laws on designated trails with a 95% confidence level that population estimates are no greater than ± 5% of the estimated true value.

Indicators to observe

Number of

- Visitor parties with at least one dog
- People per visitor party
- Dogs per visitor party
- Visitor parties who have each dog under their control on-leash while visiting a non-seasonal leash-required designated trail
- Dogs with and without a Tag Program tag visibly displayed on the dog
- Dogs with unknown tag display (observer unsure)

Statistics

Frequency data

These frequency data will be calculated for all observations.

- Number of visitor parties with at least one dog
- Number of parties with 1-n people per party (by integer)
- Number of parties with 1-n dogs per party (by integer)
- Number of parties with and without a Tag Program tag visibly displayed on the dog
- Number of parties with unknown tag display
- Number of dog-containing visitor parties in which the guardian(s) have each dog under their control on-leash while visiting a non-seasonal leash-required designated trail
    - Proportion on-leash with and without a Tag Program tag visibly displayed on the dog

3.6 Ancillary information

Additional information, to be included as a summary in final monitoring work products but not as a measured component of Tag Program compliance includes:

- Number of Voice and Sight observations with a ranger present within the observation zone
- Number of Voice and Sight related (May-July 2014 and also October 2013-September 2014):
- Ranger incidents
- Ranger summons
- Summons dispositions

Ancillary information will be used to provide further understanding of voice and sight control on OSMP. Voice and Sight related ranger information was specifically requested to be included in

final work products by the OSBT.

4.0 Monitoring Sites

The 2014-2018 site selection methods will be modeled after and as similar to the 2006-2010 methods as possible (City of Boulder 2010). Because the Seasonal and Non-seasonal Leash Required Components were added, and because OSMP decided to broaden site selection for the Voice and Sight Regulations and Leash Interview Components these respective methods have been modified to reflect this direction.

To create the sampling frame (pool of potential sites) for each component, a list was made of each unique trail within each dog regulation category included in this study (V/S, seasonal leash, year-round leash). Trails with a Mon-Fri V/S regulation and weekend leash requirement were excluded along with those trails designated as V/S on corridor. Trails with an existing monitoring site used during the 2006-2010 project remained unchanged, unless it was determined that the site did not meet the 2014 site selection criteria. System-wide, unique trails within each category that did not have a previously used site were assigned a site in an area along the trail believed to be optimal for accurate observations. This initial site selection was done within GIS, referencing forest cover, topography, time to access (no more than 60 minutes from access point), existing trail junctions and the trail alignment. Each digitized site was then visited by a field technician to determine the best off-trail observation location within the area adjacent to the digitized point. If the field technician determined the digitized point did not actually meet the selection criteria, a new site was selected in a nearby location along the same unique trail.

These site selection procedures resulted in 67 sites allocated as both an observation and interview site, 13 observation only sites, 17 interview only sites and 34 leash required sites.

<u>2014-2018 site selection criteria</u>

These criteria were used when selecting the best location along the trail for each monitoring site in the field (not all sites meet all criteria):

- Sight distance of at least 400 feet (Voice and Sight Component only)
- Audio distance of at least 400 feet (Voice and Sight Component only)
- Few visual obstructions on/along trail such as boulders, shrubs, trees, trail undulations or switchbacks
- Ease of access and available legal parking for field technician
- Not within a Trailhead Leash area
- Underlain by OSMP owned and managed property (OSMP has enforcement responsibility)

These additional criteria were used to create a sampling frame including the various settings included in the OSMP system:

- Location along trail continuum; need to represent various locations along the trail (trailhead, first quarter mile, interior)
- Recreation setting (combination of biophysical, managerial and social conditions along with infrastructure development); need to represent a range of recreation settings
- Existence of a potential challenge for dog management (water access, prairie dogs, livestock)
- Topographical setting; need to represent flats, hills, peak access, canyons

2006-2010 site distribution

During 2006-2010 there were 31 total monitoring sites. Of these, 21 sites were allocated as both observation and leash interview sites, 4 sites were observation only and 6 sites were leash interview only. Slightly less than two thirds of the sites (65%) were located along the trail, and slightly more than one third (35%) were located at or near the start of a trail. The 2006-2010 list of monitoring sites included sites with a potential off-trail challenge (35% of the sites) and ones without an obvious challenge (65% of the sites). Things considered to be potential off-trail challenges to dog management were water access, livestock presence or adjacent prairie dog areas.

The list of monitoring sites, created prior to the first data collection period, is included in **Appendix C**. This list will be modified as sites are scheduled for sampling and previously unknown problems become apparent on-site, such as changes in dog regulations, trails closures and/or openings, or trail re-routes occur during the span of 2014-2018.

4.1. Voice and Sight Regulations Component

Parameters for monitoring sites were established to create observational areas (i.e. observation zones, for an example see **Appendix D**) that had similar probabilities of exposure/stimulus for dogs which standardized monitoring sites (as best possible) across different topographical areas (**Figure 1**). These parameters include trail endpoints and a 360 degree field of view from on-trail that is bounded by approximately 200 meters off-trail (radial from trail under observation).

Figure 1: Examples of the predetermined observation zones (blue lines) within different topographical areas on OSMP.

The observation zone incorporates that portion of each trail predetermined to be within the typical visual and audio observation distance for the observer and the adjacent off-trail area typically within 180° equidistant from the observer's off-trail location (**Figure 2 and 3**). The distances for various animal species represent the species-specific flush distances. In some places, the observation zone will be greater or less than 180° based upon site conditions such as forest cover, topography, and terrain or rock formations.

Observers will be stationed at a predetermined point off-trail (observer off-set) to reduce the chances of interfering with visitor experiences and of gaining the attention of passing humans or dogs. Trail lengths and off-sets were spatially mapped and can be reviewed prior to leaving the office or a hard copy map can be taken to the monitoring site for reference during data collection. The observation zones may be bounded visually (e.g. forest cover, shrub, trees, embankment, or rock formation) and/or with loss of hearing (e.g. people talking) at a distance.

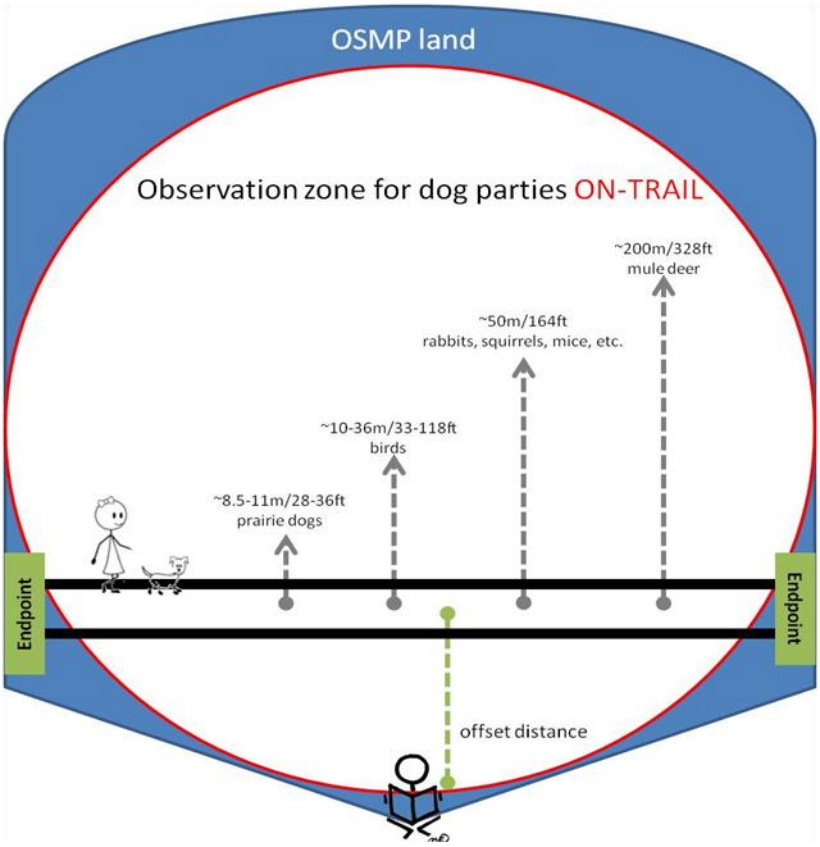

Figure 2. Example of an observation zone for dog parties that remain on-trail (not to scale). Dashed gray lines represent the typical flush distance for each respective animal type. Dashed green line represents the distance from the trail to the observer.

When parties are observed on-trail, the wildlife flush distance is defined as the distance at which an animal is displaced or moves some distance away from a disturbance, e.g. the presence of a dog party walking on-trail. The flush distances of common wildlife species will be used to

correlate dog behavior on-trail to wildlife behavior off -trail. These flush distances have been identified from the scientific literature for the common wildlife species observed on OSMP (Knight & Miller 1976; Bekoff & Ickes 1999; Miller et al 2001; Lenth et al 2006, 2008; Taylor and Knight 2003). Any interaction that occurs within the flush distance will be recorded and become part of the compliance evaluation process.

For dog parties that move off-trail (determined to be >10 feet on either side of the trail), flush distances no longer bound the observation zone. Dog parties may include all or some members off-trail (e.g. guardians on-trail, but dogs are off-trail). Instead, dogs will be assessed by two factors: eye gaze (head orientation) and directionality (the dog moving toward another person, dog, wildlife or livestock). Any interaction off-trail will become part of the compliance evaluation process.

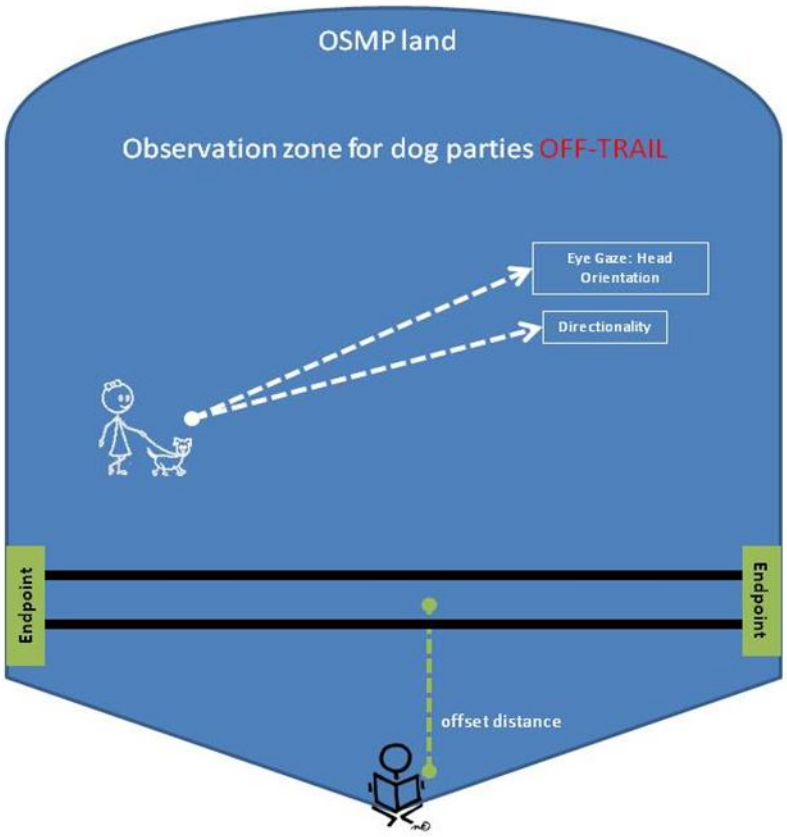

Figure 3. Example of observation zone (not to scale) for dog parties that move off-trail. Dashed white lines represent eye gaze and directionality for the dog under observation. Dashed green line represents the distance from the trail to the observer.

Staff used the following process to select the monitoring sites and the observational posts located at these sites. First, staff created a list of all trails in the OSMP system where voice and sight management of dogs is a designated option. Second, staff used GIS to review spatial data and initially determine trails that would be poor observation areas due to potential for an inadequate

sightline, heavy forest cover, hilly topography, etc. and removed these trails from the monitoring site list.

Staff field-checked the remaining trails on the list to evaluate their potential as monitoring sites. For each potential monitoring site, staff considered how well/far an observer could see and for how much of the trail the observer could hear potential visitors communicating with their dogs. For each trail, staff selected locations at the trailhead, the start of the trail or along the interior trail where the trail segment was likely to meet the site selection criteria. Staff selected locations at various distances from the trailhead because some models suggest dog behavior differs at various points along a trail (e.g. at the start of the trail, dogs may be excited about being out and may exhibit excited behaviors; dogs are more likely to defecate at the start of their excursion; dogs may be tired out or calmer during the latter part of a visit; etc.). For each trail, and as feasible for observing and hearing, trailhead and interior locations along the trail continuum were included in the site selection list. For this study, monitoring site locations are defined as:

- **Trailhead** means within 150 feet of OSMP access point/trail start
- **Start of trail** means greater than 150 feet up to one quarter mile interior from OSMP access point/trail start
- **Interior trail** means anywhere along the trail which is greater than one quarter mile interior from OSMP access point/trail start

Field technicians traveled to all potential observational posts (n=80) using the GPS unit for reference. If a potential site was found to be inadequate, e.g. limited visibility, trail length <400ft, observational post too close to the trail, etc., a new site was identified, but had to remain within the pre-determined criteria of trailhead, start of trail, or interior trail. At each potential site, the GPS unit was used to record the coordinates of the observational posts, i.e. the spot where the observer would sit/stand, and site attributes, e.g. site type, access volume, undesignated trail in view, temporary loss of view, etc. The orientation of the observer was selected by choosing approximately a 180 degree or more field of view with the greatest coverage of the trail and the surrounding area. At most sites, observation zones had natural endpoints meaning that there were ecological features, e.g. trees, rocks, etc. blocking the observer from seeing beyond the observation zone, or a loss of view resulting from a bend in the trail. However, there were some sites where the field technicians capped the observation zones at selected endpoints where the ability to hear limited visible range. Once the endpoints were determined for each site, a field technician walked the length of the trail with a GPS unit. These endpoints were also measured using a rangefinder and recorded in an excel spreadsheet. At sites with more than one trail, other trails meeting the visual and auditory requirements for field of view were also mapped using the process outlined above. Offset lengths and trail widths were also mapped for each site. Offset length measures the distance between the observational post and the trail. The width of the trail opposite from the observational post was measured with a GPS unit and a tape measure or a digital wheel.

Staff recorded the presence/absence of a potentially challenging situation for implementing voice and sight control such as proximity to a prairie dog town or water when documenting sites. The proportion of sites with a potential off-trail challenge for the 2014-2018 study was based upon the 2006-2010 study, during which approximately 35% of sites included one or more potential off-trail challenges for successful dog management. The current project has a similar proportion

of potential off-trail challenges in or adjacent to the observation zones. However, water and livestock challenges occur seasonally and this will affect whether or not these challenges are actually present on the day of the observation.

Since various people will be traveling to the observational sites at different dates/times in the future, sites photos (observational post, front view, left endpoint, and right endpoint) were taken to assist people in finding the observational posts and ensure the field of views remained consistent among multiple observers.

All data recorded in the GPS unit was transferred into a software program called GPS Pathfinder for post-corrections. Base stations near Boulder (CORS Boulder, CORS Golden or CompassTools Denver) were accessed to correct satellite positions for the recorded data. Post-corrected data was found acceptable if higher proportions of the corrections were less than 1-2 meters. Post-corrections for each site were exported as .shp files. These .shp files were merged in ArcMap (ArcGIS 10) as FOV, Offset, SiteName and TrailWidth layers and used to create a map with 80 observational sites and their respective attributes.
Lastly, to keep the ratio of sites used only for the Voice and Sight Regulations Component similar to that used in 2006-2010, staff randomly selected 10 of the new monitoring sites to be used for this component only (in addition to those sites used for both components). To do this, staff gave all the new sites a unique number and then used a random number generator to produce a list of 10 random numbers to select. The ten new randomly selected sites (**Table 1**) will be used only for collecting Voice and Sight Regulations Component data (no leash interviews).

Table 1. 2014-2018 New sites selected for only the Voice and Sight Regulations Component

Monitoring site name	**Location along trail continuum**
Goat Trail	Start of Trail
Fern Canyon Trail	Interior Trail
Crown Rock TH	Trailhead
Doudy Draw TH	Trailhead
Rangeview Trail	Interior Trail
Homestead Trail	Interior Trail
Shanahan-South Fork Trail	Interior Trail
Cobalt Trail	Interior Trail
Fern Meadow-Cragmoor Trail	Start of Trail
Marshall Mesa TH	Trailhead

4.2. Leash Interview Component

Staff used the following process to select these monitoring sites. First, staff looked at the list of trails developed for the Voice and Sight Regulations Component. Second, staff used spatial data to initially determine trails that would be poor or infeasible interview stations due to access time, ability to contact visitors, likelihood of getting visitors to stop, etc. and removed these trails from the monitoring site list. Lastly, and to keep the proportion of "interview only" sites similar to what was done previously, staff selected 13 new additional sites (**Table 2**) to add to the leash

interview location list used in 2006-2010. Staff did this by reviewing the 2006-2010 Leash Interview Component site coverage in a GIS, and determining where coverage was lacking and creating a new site would not conflict with those sites already selected to be observation only sites (**Table 1**). Sites were selected from the same categories as in the Voice and Sight Regulations Component (trailhead, start of trail and trail as described above). Sites were selected along the trail continuum, instead of only at the trail start, to capture the full range of leash compliance behaviors across varied trip distances and visitor trip lengths. Sites listed in **Table 2** are in addition to the sites to be used for both components.

Table 2. 2014-2018 New sites selected for only the Leash Interview Component

Monitoring site name	Location along trail continuum
Mesa/Bear Canyon-NCAR Trail	Interior Trail
Shanahan -South Fork/Mesa Trail	Interior Trail
Homestead/Mesa Trail	Interior Trail
Chautauqua Trail	Interior Trail
Upper Saddle Rock Trail	Interior Trail
1st/2nd Flatiron Trail	Interior Trail
Red Rocks Spur Trail	Start of Trail
Foothills North Trail	Trailhead
East Boulder-Teller Lake Trail	Trailhead
Dry Creek Trail	Start of Trail
Flatirons Vista South Trail	Interior Trail
Viewpoint TH	Trailhead
Cottonwood Trailhead	Trailhead

4.3. Dog Excrement Component

Study sites for the Dog Excrement Component are those sites used for the Voice and Sight Regulations Component and will be selected using the process described above.

4.4. Leash Required - Seasonal Leash Component

Staff used the following process to select these monitoring sites. First, staff created a list of all trails in the OSMP system that had annual seasonal leash laws in effect for the management of dogs. Then, staff used a GIS to review these trails spatially and determine where multiple seasonal leash trail segments could be surveyed at one monitoring point (such as before a trail junction). Sites were selected from the same categories as in the Voice and Sight Regulations Component (trailhead, start of trail and trail as described above). Sites were selected along the trail continuum, instead of only at the trail start, to capture the full range of leash compliance behaviors across varied visitor trip distances and time periods.

4.5. Leash Required – Year-round Leash Component

Staff used the following process to select these monitoring sites. First, staff created a list of all trails in the OSMP system that had non-seasonal (typically year-round) leash laws in effect for the management of dogs. Second, staff used spatial data to initially determine trails that would be poor observation areas due to low visibility, heavy forest cover or access time and removed

these trails from the monitoring site list. Sites were selected from the same categories as in the Voice and Sight Regulations Component (trailhead, start of trail and trail as described above). Sites were selected along the trail continuum, instead of only at the trail start, to capture the full range of leash compliance behaviors across varied visitor trip distances and time periods.

4.6. Generalizing to OSMP Dog Guardian Population

As a result of selecting monitoring sites using these methods, compliance estimates generated by this study can only be generalized to the population of dog guardians that visit trails on OSMP that allow dogs and have similar dog management as to those trails listed in **Appendix C** (no mountain summit areas or topographical peaks were monitored).

It is important to note that the monitoring study is designed to gain an understanding of the level of compliance with voice and sight requirements, leash regulations and excrement removal across all trails on the OSMP system that met our selection criteria. For each component, staff will pool data from the study sites and will not compare the individual study sites to each other. It is unlikely that any one site would have enough observations to support a statistical comparison with another site.

5.0 Methods

The 2014-2018 monitoring methods will be modeled after and as similar to the 2006-2010 methods as possible. Because some new components were added and some previously observed behaviors were removed from the observational study based upon public and Open Space Board of Trustees feedback, these respective methods have been modified to reflect this direction.

5.1. Scheduling of monitoring sessions

The first monitoring interval's scheduling procedures are described below. At the end of July 2014, the number of observations from each component will be evaluated to determine if additional monitoring should be scheduled. The 2015 and 2018 monitoring intervals will be scheduled similarly within their respective months of the year.

<u>Cancellation guidelines</u>

A session will be considered cancelled if the weather meets any of the following conditions: 1) no visitors could be expected; 2) the staff person would be miserable working in those conditions; 3) conditions would put the staff member's health or safety at risk; or 4) conditions prevent the observer from effectively completing written data sheets or 5) wind speed is greater than 15 mph or otherwise makes auditory component difficult to implement (for observation sessions). If a session would start >30 minutes later than scheduled due to delays to the staff member, that session will be treated as cancelled. Similarly, if a session's duration is less than two hours for any reason (e.g. weather deteriorates), that session will be treated as cancelled. Cancelled sessions will be rescheduled for the same location on the next respective weekday or weekend day and time period as included in the backup monitoring periods selected for the monitoring schedule. Data collected during monitoring periods that are less than 2 hours will be considered invalid and excluded from the study.

<u>Shortened session guidelines</u>

If a session is shortened due to inclement weather or other unexpected event but not cancelled

(i.e. the session is at least two hours in length), this will be documented in the "end time" and "notes" sections of the data sheets. If a session is started late, it will continue late by the same amount of time. The limit for beginning a late session is 30 minutes past the scheduled start time.

5.1.1. Voice and Sight Regulations and Leash Interview Components

During the months of May-July 2014, the Voice and Sight Regulations and Leash Interview Components monitoring will be conducted by three people, with a data collection period each day for each component. Each available day in the study period will be divided into 3 monitoring periods to reflect daylight hours from sunrise to sunset.

Generally, the morning monitoring periods will occur between 7:00 and 11:00 AM, mid-day periods between 11:30 AM and 3:30 PM and the evening monitoring periods between 4:00 and 8:00 PM. For any period containing more than 3 available hours, the start hour will be randomly assigned. General monitoring period times are summarized in **Table 1**. The actual monitoring period for any given day will be determined by the actual sunrise and sunset calendar for that month; all monitoring periods will be three hours in length and no monitoring period will begin before 7:00 AM or occur after 8:00 PM.

The monitoring project scheduler will:

1. Give each available monitoring day a unique sequential integer such that from May 12-July 20, 2014 there would be 70 unique monitoring days.
2. Give each available monitoring period (AM, Mid-day, PM) for each day a unique sequential integer such that each monitoring day has 3 unique periods where 1=AM, 2=Mid-day and 3=PM.
3. Use a random number generator to determine the monitoring period for each day.
4. Give each monitoring period with more than 3 available hours a unique sequential integer to each potential start hour. For example, a monitoring period representing 7-11 AM would be given 2 sequential unique integers to represent the potential start hours of 7 and 8 AM.
5. Use a random number generator to determine the start hour for those monitoring periods representing more than 3 hours each; include 75 numbers to cover assigned and backup sessions.
6. Once the Voice and Sight Regulations and Leash Interview Component monitoring time periods and start hour are scheduled, the scheduler will randomly select sampling sites for each component, with replacement, for each session on which monitoring is scheduled.
7. Assign missed or cancelled monitoring periods to the same location on the next respective weekday or weekend day and time period.

The Voice and Sight Regulations Component will be scheduled first, followed by the Leash Interview Component. If any randomly selected Leash Interview Component day, time period, and/or sampling site is duplicative of any monitoring period that is already scheduled for the Voice and Sight Regulations Component monitoring, the scheduler will use the next available location in the random selection list to schedule the Leash Interview Component monitoring.

5.1.2. Dog Excrement Component

Data collection for the Dog Excrement Component will occur simultaneously with data collection for Voice and Sight Regulations Component and will take place during those monitoring periods.

5.1.3. Leash Required Component

Seasonal Leash Component

Data collection for the Seasonal Leash Component of the monitoring will be conducted by three people, for a total of 21 monitoring periods during the study period. Monitoring days and time periods for this component will be scheduled randomly by:

1. Give each of the 70 available days (May 12-July 21) a unique sequential integer.
2. Use a random number generator to produce a list of 25 numbers in between 1-70 (without replacement), such that each number will represent one selected day for monitoring.
3. Use a random number generator to produce a list of 25 numbers in between 1-3, with replacement, such that each number would represent one selected time period for one monitoring day.
4. Give each monitoring period with more than 3 available hours a unique sequential integer for each of the two potential start hours. For example, a monitoring period representing 7-11 AM would be given 2 sequential unique integers to represent the potential start hours of 7 and 8 AM.
5. Use a random number generator to determine the start hour for those monitoring periods representing more than 3 hours each; include 25 numbers to cover assigned and backup sessions.
6. Assign missed or cancelled monitoring periods to the same location on the next respective weekday or weekend day and time period.

Year-round Leash Component

Data collection for the Non-seasonal Leash Component of the monitoring will be conducted by three people, for a total of 67 monitoring periods during the study period. Monitoring days, time periods and sampling sites for this component will be scheduled similarly as the Voice and Sight Regulations and Leash Interview Components.

5.1.5. Scheduling the second and third monitoring intervals

Randomization and scheduling for the 2015/2018 field sampling will use the same procedures as outlined above.

5.2. Field procedures

For all components, field personnel will arrive at the monitoring site at least ten minutes prior to the start of the monitoring period. Most monitoring sites will require a hike from the trailhead or other parking area and the time necessary to access the site should be appropriately planned for. Field technicians will determine if the monitoring point (typically on the designated trail) has an adjacent undesignated trail. If present, the technician will observe both the designated trail and the undesignated trail through the observation zone. For all components, field technicians will bring a hard copy list of monitoring sites with them, including all of the attribute data stored in the dog monitoring site geodatabase, to confirm or make notes about site characteristics that have

changed over time. If any of the attribute data is out of date, the field technician will note what is changed and what the current data should be, on the hard copy list and provide these corrections to the monitoring scheduler. The monitoring scheduler will then make the necessary revisions to the various tracking sheets for the project along with the spatial and attribute data within the GIS. Attribute data will be maintained such that it could be used to understand dog management under various conditions on OSMP (e.g. compliance levels at varied locations along the trail continuum).

Field technicians will be polite during any visitor interactions and attempt to maintain neutrality and represent the department (not self) when answering questions about the project. If questioned beyond their comfort level, technicians will refer the visitor party to the project manager (or the appropriate OSMP staff member based upon the topic).

If no visitors are observed during any session for any component, the field technician will still fill out a datasheet's header information and note within the notes section that no visitors were observed.

5.2.1. Voice and Sight Regulations Component

Field personnel will ***not*** wear attire that identifies them as OSMP staff and will follow the procedures outlined below. Any additional details about any site condition that may be important in understanding visitation levels and/or visitor behaviors on that day and time will be recorded on the datasheets. Before leaving for a monitoring assignment, field personnel will follow field protocols outlined in **Appendix E**.

Once the monitoring session begins, the observer will observe the first visitor party with one or more off-leash dogs that enters the observation area from any direction of travel. The observer will record the number of dogs and people in the visitor party. The observer will watch the visitor party the entire time the party remains in the observation area. As feasible (observer ability to remember any one party), the observer will record each visitor party only once, even if any given party re-enters the observation zone and should, according to this protocol, be the next observed party.

The observer will record the following attributes of the visitor party (**Appendix F**):

1. The field VP (Visitor Party) number
2. The number of people
3. The activity type of the people
4. The number of dogs
5. The number of visible leashes
6. The number of dogs that are leashed the entire time in the observation area (for parties that include off-leash dogs)
7. The number of dogs that are unleashed for some time or the entire time in the observation area
8. The number of dogs, whether leashed or unleashed, with and without a green voice and sight tag (VST) and the number of dogs for which no determination could be made regarding whether they were wearing a VST or not due to poor visibility and/or the characteristics of some dogs (e.g. dogs with shaggy coats or wearing a tag pouch)

9. All observed human, dog, equestrian, wildlife and livestock passes, interactions and behaviors listed in **Appendix B**. The observer will record any pertinent notes regarding the pass, interaction or behavior observed in the "Notes" section of the datasheet.
10. The number of dogs that are not within view of their guardians. Within view means the guardian can see the dog immediately or by turning his or her head (or within a 360° field of view). Tall vegetation, topography, and winding trails are possible reasons why a dog is not within view. The reason the dog is not within view should be noted in the "Notes" section of the datasheet.
11. The number of commands issued to the dog(s) in the party, the type of command, the words used by guardian if possible, and the dog response. The guardian will be observed for all attempts to obtain control of the dog.
12. Whether or not the dog entered a visitor closure area.
13. Ranger or other OSMP staff presence (also includes uniformed volunteers) in the area
14. Whether or not there were more than two unleashed dogs per guardian in the visitor party.
15. The number of times the dog(s) in the visitor party poop in the observation area. If none of the dogs in the visitor party poop while in the observation area, the observer will record a "0" in the first column under "Excrement" on the data sheet and a "NA in the two following columns under "Excrement". For each party with one or more poop events, the observer will note whether the guardian picked up all the excrement or not. If the guardian picked up the poop, the observer will note whether the guardian took all the poop bags with him or her out of the observation area or whether the guardian left the poop, presumably in a bag, in the observation area.
16. Whether or not any observable injury resulted from any interaction.
17. Anything unusual about the observation or anything that helps explain data entered in specific columns of the datasheet about the observation.

Once the dog-containing visitor party that is being observed leaves the observation area, the observer will begin observing the next dog-containing party that enters the observation area repeating the process described above.

5.2.2. Leash Interview Component

Field personnel ***will*** be attired in field gear that identifies them as OSMP staff. Before leaving for an interview assignment, field personnel will follow field protocols outlined in **Appendix F**.

Upon arrival at the monitoring location, the observer will set up the "Please STOP!" sign-a-cade and enter the session information in the datasheet. Staff will use the datasheet to record the following data:

<u>For each dog-containing party (party has one or more dogs off-leash)</u>:

1. Temporary visitor party number
2. Number of people
3. Number of dogs
4. Human activity type
5. Number of tag/no tag/unsure tag displayed for leashed and unleashed dogs
6. Number of visible leashes

7. Whether the party stopped or not
8. Whether or not the party showed the interviewer his/her leash(es)
9. The number of leashes shown to interviewer
10. Whether or not there is ranger presence in the area (within Notes field)
11. Anything unusual about the observation or anything that helps explain data entered in specific columns of the datasheet about the observation

When the interview session begins, the staff member conducting the interviews will observe visitor parties with a dog that enter the observation zone from any direction. If staff sees that the guardian has a leash for each dog being managed under voice and sight control, staff will document this on the datasheet by recording one tally under "Total number of dog parties interviewed" and one tally under "Number of parties with a leash visible for each dog" (for each respective visitor activity type). For many visitor parties, the leashes for each dog being managed under voice and sight will be visible in the guardians' hands or on their bodies. Staff will ***not*** attempt to contact the visitor party when leashes for all dogs in the visitor party are visible.

When no leash is visible or the number of visible leashes is less than the number of dogs being managed under voice and sight control, the interviewer will approach the dog-containing visitor party and ask the party's willingness to engage in an interview using a script similar to the following:

Hello. My name is interviewer's name. *I am with OSMP. We are conducting visitor interviews today to help us get an understanding of visitor experiences and improve our visitor management strategies. Would be willing to help us by answering one question?*

If the visitor declines to participate in the interview, the interviewer will thank them. If the visitor agrees to participate, the interviewer will continue with the interview using a script similar to the following:

The question is related to dog management so before I ask it I want you to know that I am not a ranger; I'm not going to ask your name; and I can't and won't be issuing a summons for any answers you give. We are simply trying to understand the current conditions on the ground.
If the visitor still appears willing to participate, the interviewer will ask:
Would you show me a leash for each of your dogs you are managing under voice and sight control today?

After the interview, thank the visitor for his or her time and willingness to help OSMP. If the visitor party did not have a leash for each dog in the visitor party, the interviewer will offer the visitor party the appropriate number of complementary OSMP kennel leads. Once the visitor party leaves the interviewer and the party continues their visitor trip, the interviewer will record information contained in **Appendix G**, as appropriate, on the datasheet. Observers will also note any details about potential ranger presence in the area (e.g. ranger truck in parking lot).

After the interviewer has completed recording his/her notes from the interview, the interviewer will approach the next dog-containing visitor party encountered in the interview area and repeat

the process.

For dog-containing parties that do not stop
The interviewer will only observe whether the party has a leash visible for each dog being managed under voice and sight control. If no leash is visible or the number of visible leashes is less than the number of dogs being managed under voice and sight, the interviewer will document this on the datasheet under the appropriate visitor activity type.

5.2.3. Dog Excrement Component – collected concurrent with Voice and Sight Regulations Component

Field preparation, set-up and data collection will occur as outlined in the Voice and Sight Regulations Component field methods.

5.2.4. Leash Required Components - Seasonal and Year-round

Field preparation and set-up will be similar to Voice and Sight Regulations Component. Field personnel will ***not*** wear attire that identifies them as OSMP staff. Before leaving for a leash required assignment, field personnel will follow field protocols outlined in **Appendix F**.
Upon arrival at the monitoring location, the observer will enter the session information in the datasheet. Once the monitoring session begins, the observer will attempt to observe each dog-containing visitor party that crosses over the observation point. The observer will record the following attributes of each visitor party, as shown in **Appendix H**:

1. The field VP number
2. The number of people
3. The human activity type
4. The number of dogs
5. The number of leashed dogs with and without a tag
6. The number of unleashed dogs with and without a tag
7. The number of leashed and unleashed dogs with unknown tags display
8. Whether or not there is ranger presence in the area (within Notes field)
9. Anything unusual about the observation or anything that helps explain data entered in specific columns of the datasheet about the observation.

Note: For observation sessions at Lost Gulch and Buckingham Park, observers will be monitoring all trails due to the relatively short distances of each trail. Observers will also record an observation if the visitor party steps onto any of the trails at the access point.

5.3. Data entry procedures and GIS data management

Detailed data entry procedures and methods are included in **Appendix I**. Detailed GIS data management procedures and methods are included in **Appendix J**.

5.4. Changes to the 2006-2010 protocol implemented during the 2014-2018 project:

Rationale for 2014-2018 Monitoring Design
Staff were asked by City Council and the Open Space Board of Trustees to re-design the tag monitoring project for 2013-2017 (post-flood dates changed to 2014-2018). Since the ordinances related to voice and sight control in the Boulder Revised Code (BRC) do not provide definitive parameters by which a guardian must "adequately control a dog using voice and sight

commands" (BRC 6-1-2) in order to prevent specific outcomes from taking place, the staff developed a monitoring project that would align with the rangers' interpretation of the BRC regarding voice and sight control by incorporating the thought process rangers use in enforcing these regulations. Since enforcement of the VS regulations of the BRC requires a perspective that looks at behaviors in context (as part of a situation) rather than as isolated components, we accomplished this alignment by hiking with rangers on patrol and obtaining real-time information on encounters involving dog guardians. For example, when evaluating compliance during an interaction, we take into account the response of the other party involved rather than basing compliance solely on the actions of the visitor party under observation. This information gave us insight for understanding specific situations where rangers will write tickets versus using alternative options such as issuing warnings or engaging in educational talks. We began developing a *context-specific* monitoring project, with the emphasis on capturing dog behaviors and guardian responses that are specifically outlined in the BRC for situations involving chasing, harassing or disturbing people, other dogs, wildlife or livestock. Furthermore, the re-design separates monitoring into two distinct processes: 1] the collection of descriptive data by trained observers and 2] the evaluation of the collected data by a committee comprised of OSMP staff and rangers for compliance determination. In other words, compliance will not be determined by the observers, to address public comments regarding observer bias.

To understand the level of compliance for dog regulations on the entire system, seasonal and non-seasonal leash trails will be included in the 2014 monitoring design in addition to voice and sight trails designated with low visitor volume. To ensure that we are collecting data on voice commands directed at controlling dog behaviors versus dog guardians conversing with their dogs, we included an auditory component where observers must be able to hear and record guardians' specific commands.

List of Changes:

1. Removed conflictive behaviors terminology (as documented in 2006-2010); revised behavior definitions to reflect the voice and sight ordinance language
2. Added a mid-day weekday monitoring period
3. Added a late afternoon/early evening weekend monitoring period
4. Added observation of leash-compliance in non-seasonal and seasonal leash-required areas
5. Added a summary of ranger observations, incidents, summons and convictions
6. Added additional voice and sight monitoring sites including very low to high volume locations along with sites located more interior on the OSMP system
7. Removed observation of leash only parties from the Voice and Sight regulations component
8. Modified behavior coding strategy and behavior definitions
9. Added recording commands given along with dog/guardian responses
10. Modified length of visitor party observation to entire observation zone; previously visitor parties were observed within the zone only until something caused them to be out of compliance (could be a portion of the entire zone)
11. Moved off-trail sites as needed to facilitate auditory monitoring of dog guardian commands
12. Changed to random site selection

13. Changed to random day selection
14. Added additional leash interview sites including very low to high volume locations along with sites located more interior on the OSMP system
15. Removed "unsure" tag observation from compliant proportion to become unique category
16. Added "livestock" to potential off-trail challenge list for dogs list
17. Removed determination of "negative" or "positive" interactions in the field
18. Revised determination of overall compliance to be evaluation outcome for each visitor party to include interpretation of each visitor party's collected attributes, interactions and commands; determination of compliance *will not occur in the field* by the data collector, and *will be determined later in the office* by an experienced team representing monitoring, project team and ranger staff

6.0 Quality Assurance/Quality Control Procedures

To produce the highest quality data set possible and maintain data integrity, monitoring staff will implement the quality assurance/quality control procedures listed below.

Protocol and definitions training

Prior to the start of the monitoring, staff members responsible for collecting data will receive extensive training in the office and then in the field at an area of high dog use. This will provide an opportunity for staff to observe the behaviors and conditions being evaluated by this monitoring. Field technicians will be trained to identify the current OSMP voice and sight control tag and decipher this tag from other common tags such as the Boulder County rabies tag and the City of Boulder dog license tag (**Figure 4**).

OSMP Tag Program City of Boulder dog license Boulder County rabies

Figure 4. Common dog tags found in Boulder, Colorado

Inter-observer agreement test

When data collection staff is consistently observing the indicators outlined above during the training period, a real-time field test will be scheduled to measure the level of inter-observer agreement in data collection. During this field test, all data collection staff will silently and simultaneously complete an observation session of 3 hours at 2 or more sampling locations representing a range of monitoring site conditions (e.g. visitation volume, location along trail).

To determine the level of agreement among observers during the field test, staff will conduct an inter-observer agreement test. Staff will use Cohen's kappa, which is commonly used to measure inter-observer agreement when the observed variables are categorical. This test will allow staff to have a quantifiable measurement of how well two raters agree on their observations during any given monitoring session. The results of this test will be used to determine any necessary modifications to protocol definitions or field methods prior to official data collection monitoring periods. The minimum level of consistency is set at 0.6, which is an acceptable and common practice among researchers doing similar studies (Landis and Koch 1977; Sim and Wright 2005). We will also hold weekly meetings to discuss variations that arise and to serve as checking sessions (make sure everyone is still on the same page about definitions, etc.).

Our observed overall kappa for the 2014 project was 0.75 (City of Boulder 2015).

Adherence to monitoring protocols

Staff will make efforts to adhere to all monitoring protocols. Training will be provided to assure understanding of the protocols and definitions. When a variance to methods must occur (e.g. new type of interaction or behavior), the new type of interaction or behavior will be noted in the field, de-briefed in the office with other team members and then considered in the analysis.

Data quality check procedures

In the field (or in the office) on the same day as data collection

Field staff can correct their own respective mistakes on the same day of the shift/observation by crossing out the incorrectly written value in pencil and then writing the correct value next to it on the datasheet or by writing in a forgotten entry. Field technicians *should only do* so if they are certain of the changes. Examples of these types of errors could include:

- Having a record on the datasheet where the total number of dogs documented and the sum of the numbers entered for the numbers of dog(s) on-leash/off-leash do not match;
- Failing to record a weather variable for a given day;
- Recording an "N/A" for a variable that should have an entry
- Having a record that indicates "no tag" on the Visitor Party sheet while an indication of a "tag" on the Interactions sheet

At the end of each shift, the staff member will review all recorded entries and document this review occurred by filling in the "Field QC" section of the "Data Quality Check" table on the back of each datasheet (**Table 3**).

Table 3. Example of data quality check documentation from Visitor Party datasheet

Data Quality Check: Visitor Party		
"Session ID" and "Visitor Party Number" (in red) are auto-generated numbers upon database entry		
Date: Field QC	**Initials**	**Comments**
Date: Data Entry	**Initials**	**Comments**
Date: Data Entry QC	**Initials**	**Edits Made**

Data entry in the office

In the office, each field technician will enter his/her own data. When entering their own data, staff will look for and correct (on the hard copy datasheet) any errors associated with recorded field data. Examples of these types of errors could include:

- Forgetting to document the visitor party number auto-generated by the database on the hard copy of the datasheet;
- Finding an error that was not corrected during initial data entry (see above)

When correcting their own data, staff will follow these rules:

- A **blue** or **black** ink pen should be used to mark changes to the pencil entries on the hard copy datasheet
- Each change will be initialed by the staff member

When all data has been entered and Q/C'd by the staff member that collected it, this person will fill in the "Data Entry" section of the "Data Quality Check" table on the back of each datasheet and also electronically enter the associated entry information in the "Quality Check for Data Entry" section of the database (**Figure 5**).

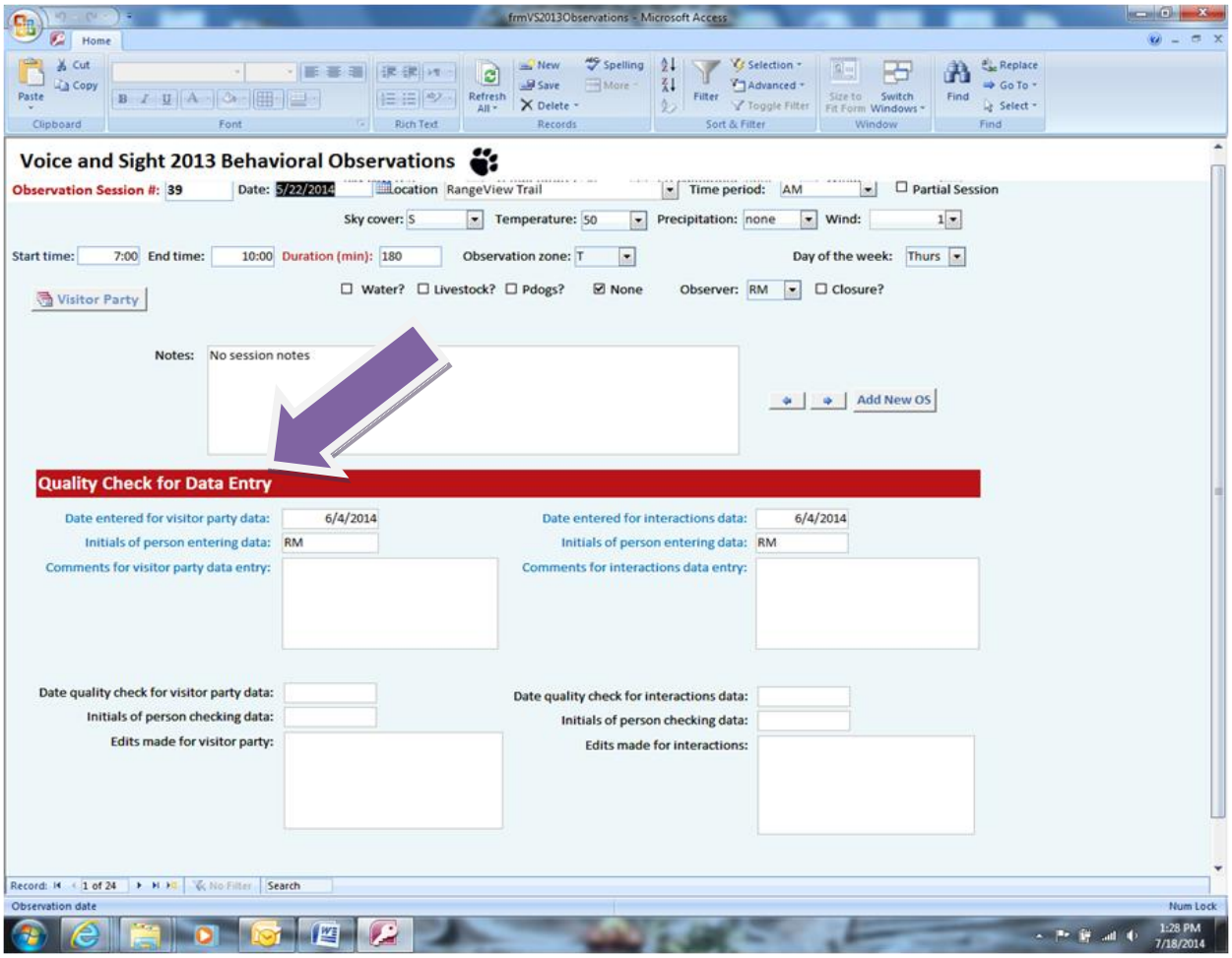

Figure 5. Example of quality check from "Behavioral Observations" section of database

Data entry Q/C

All data entry will be checked for accuracy by a staff member who did not originally enter the data. Errors found during this quality control procedure will be tracked and then revised to reflect the correct entry.

When correcting another staff member's entered data, staff will follow these rules:

- A **red ink pen** should be used to mark changes to the hard copy datasheet
- Each change will be initialed by the staff member

When all entered data has been Q/C'd by a staff member that did not collect it, this person will fill in the "Data Entry QC" section of the "Data Quality Check" table on the back of each datasheet and also electronically enter the associated quality check information in the "Quality Check for Data Entry" section of the database (**Figure 5**).

7.0 Data reduction and analysis

Data reduction for each indicator will be conducted as appropriate for each data type. For example, guardian commands given could be thematically coded using key words or phrases.

Data analysis will be conducted within Microsoft Excel, R statistical package, SPSS and/or SAS as feasible and necessary to calculate the statistics outlined in section three of this protocol.

As requested by project team members, OSMP management staff, the OSBT or City Council, additional analysis will be conducted to determine if any relationships exist between variables. For example, questions such as "Is there a correlation between the time of day, tag display or location along the trail continuum and the overall compliance level" or "Do visitor parties with leashed dogs have a greater chance for including dogs without a V/S tag?".

7.1 Pre-determined coded or fixed response categorical indicators

For indicators with pre-determined categories and codes, data will be summed by indicator by the event (for indicators observed at the event level), by visitor party and for the entire sample. These indicators (and codes) are:

- Tag display (yes/no/unsure); a visitor party with more than one dog has the potential to include one or more categories
- Out of sight (yes/no); a visitor party with more than one dog has the potential to include one or more categories; recorded at the event level
- Two or more dogs off-leash per guardian (yes/no)
- Dog behaviors; recorded at the event level
- Dog guardian issued a command (yes/no); recorded at the event level
- Dog responses to command issued; recorded at the event level
- Dog guardians in possession of a leash for each off-leash dog in their party (yes/no)
- Dog guardians who immediately pick up and/or bag all excrement (yes/no); recorded at event level
- Dog guardians who properly dispose of or take with them any excrement bag (yes/no); recorded at event level
- Dog guardians who have each dog under their control on-leash while visiting a leash-required designated trail (yes/no)

7.2. Numerical indicators

Numerical indicators

- People per party
- Dogs per party
- Excrement events

7.3. Open-ended indicators coding guidance

Some of the indicators will include observations and recording of conditions in a naturalistic setting (with and without predetermined codes). These indicators will be recorded by the observer as accurately as possible. Data from these indicators may be classified into categories using both an emergent approach, where themes are revealed through content analysis of the text recorded in the field, combined with a deductive approach, where a scheme or codes are predetermined and applied to the data. Observations associated with individual themes may also be further collapsed into combined categories as appropriate. For example, the two commands "Come" and "Come here", as recorded in the field, could be combined into one thematic category during analysis. Indicators that include some portion of open-ended coding include:

- Dog guardians who fail to comply with the regulation prohibiting their dog from

charging, chasing or other displays of aggression toward a person
    - Charge/chase/display aggression is determined by a combination of the dog's behavior, the other's response, and the guardian's actions.
- Dog guardians who fail to comply with the regulation prohibiting their dog from chasing, harassing or disturbing livestock or wildlife
    - Chase/harass/disturb is determined by a combination of the dog's behavior, wildlife or livestock response and the guardian's actions.
- Proportion of visitor parties who fail to comply with the regulation prohibiting their dog from charging, chasing or otherwise displaying aggression toward any dog
- Compliance means that a dog does not charge, chase or otherwise display aggression toward any dog
    - Charge/chase/display aggression is determined by a combination of the dog's behavior, the other dog's behavior and the guardian's actions.
- Commands issued by guardians

7.4. Compliance with Voice and Sight regulations

- Overall compliance will be an aggregate measure of the tag display, more than 2 dogs off-leash, out of sight, command/dog response, and prohibition of charging/chasing/disturbing another human, dog, wildlife or livestock variables
- Leash possession compliance will be observed, analyzed and reported on separately from the other Voice and Sight measures included in this study, based on data obtained from the Leash Interview component.

7.5. Comparison across monitoring periods

Results for each of the indicators will be compared between monitoring periods. When possible, statistical tests will be used to determine the significance of any observed differences between 2014-2018 monitoring periods and between the 2014-2018 and 2006-2010 studies. For example, the chi-square statistic could be used to determine any statistical significance differences of the results for the overall compliance rates or for the proportions within individual indicators between 2014 and 2015.

8.0 Possible limitations

1. It is not physically possible to place continuous focus upon more than one visitor party at any one time and this will result in a smaller sample size than the previous project.

2. Even with a well-defined coding system, human, dog, wildlife and livestock behavior observation involves some level of subjectivity associated with classifying situations and interpreting outcomes.

3. The observation zone includes only a portion of any one visitor trip. The length of visitor trips reported by dog guardians during the 2010-2011 Visitor Survey ranged from less than 30 minutes to more than 2 hours. Any rates of compliance calculated should be understood as compliance rates through the observation area only. We cannot measure compliance rates for an entire visitor trip.

Table 4. Length of visitor trip by activity group

Visit length	Hikers	Runners	Cyclists	Dog Guardians	Other
<30 minutes	10%	26%	20%	**19%**	12%
30 to 59 minutes	26%	49%	34%	**41%**	21%
60 to 89 minutes	24%	15%	18%	**20%**	18%
90 to 119 minutes	17%	7%	12%	**9%**	19%
120+ minutes	24%	3%	16%	**11%**	30%
Total	100%	100%	100%	**100%**	100%

4. Reporting results by sub-group tag or no tag display as a measure of Tag Program participation/non-participation results in some level of unknown error as we cannot assume those parties observed without a visible tag displayed on a dog are not program participants and vice versa. Also, for visitor parties of more than one person, we can't know for sure if the person that "calls" to a dog is a Tag Program participant; all we can observe is whether the dog has a tag on or not.

5. Some number of observed dogs will have "unknown tag display" due to poor visibility, long fur, tag pouches, etc. There is no way to know if off-leash dogs with unknown tag display are being managed by Tag Program participants. Observations with only unknown tag display will remain a unique category and thus, results for the tag compliance measure will include some number of observations that are actually indeterminate for the indicator "visible display of tag". It is likely that the number of unsures will be greater for the observation component compared to the leash interview component due to the greater distance between the dog and the field technician.

6. We have no way to interpret how visitor parties with dogs differ from non-dog parties in reference to human/dog/wildlife responses; we can't say if dog parties have more, similar or less impact because we are not measuring human/dog/wildlife responses associated with non-dog parties.

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Appendix A. Glossary of terms used within this protocol as defined for this monitoring project

Boulder Revised Code – Animal Control Related
6-1-2 Definitions
http://www.colocode.com/boulder2/chapter6-1.htm#section6_1_2

"Guardian" means owner.

"Leash" means a chain, rope, cord, or strap with a clip or snap for rapid attachment to a choke chain, collar, or harness, all the parts of which are of sufficient strength to hold at least four times the weight of the dog and are suitable for walking the dog and controlling it.

"Owner" means each person who owns an animal. If an animal has more than one owner, all such persons are jointly and severally liable for the acts or omissions of an animal owner under this chapter, even if the animal was in possession and control of a keeper at the time of an offense.

"Voice and sight control" means the ability of a guardian or keeper to adequately control a dog by using voice commands and sight commands (such as hand gestures). In order for a guardian or keeper to have voice and sight control over a dog, the guardian or keeper must: (1) be able to see the dog's actions; and (2) be able to prevent the dog from engaging in the following behaviors, using voice and sight commands, without regard to circumstances or distractions:

(a) Charging, chasing or otherwise displaying aggression toward any person or behave toward any person in a manner that a reasonable person would find harassing or disturbing;
(b) Charging, chasing or otherwise displaying aggression toward any dog;
(c) Chasing, harassing or disturbing wildlife or livestock; or
(d) Failing to come to and stay with the guardian or keeper immediately upon command by such person.

Other Terms

Collapse: Process of: 1) classifying the complete suite of ideas represented in verbatim text recorded for open-ended variables into a series of categories and/or 2) reducing the full suite of categories into combined categories based upon content analysis of the text.

Emergent category: A theme revealed through content analysis and collapsing of semantically similar verbatim text reported for open-ended variables.

Empathic neutrality: A distinctive characteristic of qualitative researchers who strive to be nonjudgmental when compiling findings.

Field of view/Observation zone: The extent of the landscape to be included in the observation. The field of view includes areas off-trail within the observation zone typically within 180° equidistant from the observer and to include the depth of field as defined by the flushing distances of wildlife species included in this study. Fields of view were set up to represent the typical visual and auditory ability of an observer.

Frequency distribution: The number or percent of subjects within each possible response for a particular variable.

Inter-rater or Inter-observer reliability: The degree to which different raters/observers give consistent ratings/estimates of the same phenomenon using the same rating system. http://www.socialresearchmethods.net/kb/reltypes.php

Naturalistic observation: A research method commonly used by psychologists and other social scientists which involves observing subjects in their natural environment. This type of research is often utilized in situations where conducting lab research is unrealistic, cost prohibitive or would unduly affect the subject's behavior. http://psychology.about.com/od/nindex/g/naturalistic.htm

Out of sight: The dogs in a visitor party are not within the immediate 360° field of view of the guardian(s) at all times.

Recreation setting: A combination of the physical, biological, managerial and social conditions within a recreation area that gives value to a place (Clark and Stankey 1979).

Reliability: The extent to which an experiment, test or any measuring procedure yields the same result on repeated trials. http://writing.colostate.edu/guides/page.cfm?pageid=1386

Sampling Frame: The sampling frame consists of two components: 1) All the OSMP trails with designated dog opportunities meeting our selection criteria and 2) All the dates and time periods within the data collection period.

Target Population: The group of interest to be investigated; dog guardians are the population for this project.

Validity: The degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure.

Visitor trip: A trip to the study area, regardless of how much time a visitor spent on OSMP during their trip.

Voice and Sight Tag Program: An OSMP program designed to certify dog guardians' understanding of what "voice and sight" dog management means while visiting OSMP lands. After watching a video demonstrating what voice and sight dog management means, a dog guardian can purchase a green tag for their dog allowing them to manage their dog under voice and sight control in designated areas.

Appendix B. Voice and Sight regulations component behaviors, definitions and relevant B.R.C.

PERSON BEHAVIOR	DEFINITION	EXAMPLES	RELEVANT B.R.C
No behavior observed			N/A
Verbal invitation	Vocalizations (e.g. words, whistles, sounds etc.) directed towards the dog ; “attention-getting” (Horowitz & Bekoff 2007); could be initiated or response	Approaching visitor says "Oh my gosh, you are so cute. Come here!"	
Physical invitation	Hand and/or arm is extended away from the person’s body and towards the dog; “contact seeking” (Vas et al 2005); could be initiated or response	Approaching visitor kneels down and extends arm toward oncoming dog	
Avoidance	Moving away, head/body averted, hands up palms out	Approaching visitor steps laterally away or off-trail to avoid contact with oncoming dog	
Verbal protest	Verbal statements and/or noises accompanied by gestures (hands up palms out, shaking head, etc) directed towards dog and/or guardian expressing objection to dog presence and/or behavior	Approaching visitor says "Keep your dog away from me"	
Physical protest	Body movements directed towards getting dog to stop the behavior or for harming the dog	Approaching visitor kicks leg out to get dog away from his/her feet	
Other	Any other behavior observed		

DOG BEHAVIOR	DEFINITION	EXAMPLES	RELEVANT B.R.C
No behavior observed			N/A
Jumping/pawing	PHYSICAL CONTACT REQUIRED; A jumping or pawing dog is one with movements between the moment the paws leave the floor until they are back in contact with the ground (Ladha et al 2013) (front or all paws) with front paws working independently of each other. A pawing action corresponds to repeated backwards pulls toward the dog's belly and hind legs of a single paw (Ladha et al 2013)	A dog jumps up and makes physical contact with another human; a dog paws a child's legs as he/she walks by	6-1-16. Dogs Running at Large Prohibited. 6-1-20. Aggressive Animals Prohibited. (Would need to be combined with a negative response from receiving party or a prohibited behavior to be considered violation)
Charging/chasing	A charging or chasing dog is one that incorporates gaits galloping and trotting resulting in forward motion of the dog (Ladha et al 2013) and/or a "violent rush forward" with the head/body oriented toward "other" present; other present could be wildlife, livestock, person or dog	Dog chasing a fleeing deer or charging an approaching dog	6-1-16. Dogs Running at Large Prohibited. 6-1-20. Aggressive Animals Prohibited. 8-3-5. Wildlife Protection

DOG BEHAVIOR	DEFINITION	EXAMPLES	RELEVANT B.R.C
Aggression display	An aggressive animal is one that bites, claws, or attempts to bite or claw any person; bites, injures, or attacks another animal; or in a vicious or terrorizing manner approaches any person or domestic animal in an apparent attitude of attack, whether or not the attack is consummated or capable of being consummated.	Frontal display with teeth and lips showing (Abrantes 1997); Continuous vocalizations of low tones (growling); Attempts to make firm mouth contact or attempts to bite	6-1-16. Dogs Running at Large Prohibited. 6-1-20. Aggressive Animals Prohibited. 8-3-5. Wildlife Protection
Barking	Barking is vocalization of loud sounds. The head is often elevated and thrown forward at the moment of the bark (Ladha et al 2013); can be directed at other (Horowitz 2009); "attention-getting" (Horowitz & Bekoff 2007); elevated intensity or frequency	A dog is repeatedly barking at a bird on the side of the trail; dog is standing still on the trail continuously barking at an approaching visitor party	6-1-16. Dogs Running at Large Prohibited. 6-1-20. Aggressive Animals Prohibited. (Would need to be combined with a negative response from receiving party or a prohibited behavior to be considered violation) 8-3-5. Wildlife Protection

Code#	Description	Example
999	Missing value	Observer forgets to code variable
777	Unsure	Observer is unsure dog pooped
555	Not applicable	Tag display for leashed dog

Appendix C. List of monitoring sites included in 2014 sampling frame listed by Trail Study Area

Site Name	Site Type	Trail Study Area	Visitation Volume	Trail Continuum
Bobolink Trail New	Both	East	High	Start of Trail
Boulder Creek Path - Foothills	Leash Required	East	Low	Interior Trail
Centennial Greenway	Both	East	Low	Start of Trail
Cherryvale TH	Leash Required	East	Low	Trailhead
Cottontail Trail	Leash Required	East	Low	Interior Trail
Cottonwood TH	Interview	East	Low	Trailhead
Cottonwood TH	Leash Required	East	Medium	Trailhead
Cottonwood Trail	Both	East	Low	Start of Trail
Dry Creek Trail New	Both	East	High	Interior Trail
East Boulder - Teller Lake ADA	Leash Required	East	Medium	Interior Trail
East Boulder-Teller Lake Trail	Interview	East	Medium	Start of Trail
East Boulder-Teller Lake North Trail	Interview	East	Medium	Trailhead
Gunbarrel TH	Both	East	Medium	Trailhead
Gunbarrel Trail	Both	East	Medium	Interior Trail
KOA Lake Greenway	Leash Required	East	Very Low	Interior Trail
South Boulder Creek at EBCC	Both	East	High	Interior Trail
South Boulder Creek Greenway	Leash Required	East	High	Start of Trail
Teller Farm TH	Both	East	Medium	Trailhead
Teller Farm Trail	Both	East	Medium	Interior Trail

*Both means the site was used for the observation and the interview components

Site Name	Site Type	Trail Study Area	Visitation Volume	Trail Continuum
Buckingham Park	Leash Required	North	Medium	Trailhead
Cobalt Trail	Observation	North	Medium	Interior Trail
Degge Trail	Both	North	Medium	Start of Trail
Eagle Shelter	Both	North	Medium	Interior Trail
Eagle TH	Both	North	Medium	Trailhead
Eagle West New	Both	North	Medium	Start of Trail
Foothills North Trail	Interview	North	Medium	Trailhead
Foothills South/Old Kiln	Leash Required	North	High	Interior Trail
Foothills TH New	Both	North	Medium	Start of Trail
Foothills Trail	Both	North	Medium	Interior Trail
Fourmile Creek Greenway	Both	North	Low	Interior Trail
Hidden Valley Trail	Both	North	Medium	Interior Trail
Lefthand Trail	Leash Required	North	Low	Interior Trail
Lefthand Trailhead	Leash Required	North	Low	Trailhead
Mesa Reservoir Trail	Both	North	Medium	Interior Trail
North Rim Trail	Both	North	Low	Start of Trail
Old Kiln Trail	Leash Required	North	Medium	Interior Trail
Sage TH	Both	North	Medium	Trailhead
Sage Trail	Both	North	High	Interior Trail
Wonderland Hill Trail	Leash Required	North	Low	Start of Trail
Wonderland Lake TH	Leash Required	North	Medium	Trailhead
Wonderland Lake Trail	Leash Required	North	High	Interior Trail

*Both means the site was used for the observation and the interview components

Site Name	Site Type	Trail Study Area	Visitation Volume	Trail Continuum
Coal Seam Trail	Both	South	High	Interior Trail
Cowdrey Draw	Leash Required	South	Medium	Interior Trail
Doudy Draw TH	Observation	South	Medium	Trailhead
Doudy Draw/Community Ditch New	Both	South	Medium	Interior Trail
Flatirons Vista South Trail	Interview	South	Medium	Interior Trail
Flatirons Vista TH	Both	South	Medium	Trailhead
Flatirons Vista Trail	Both	South	Medium	Interior Trail
Fowler Trail	Leash Required	South	Low	Start of Trail
Greenbelt Plateau Trail	Leash Required	South	Medium	Interior Trail
Greenbelt Plateau Trail	Both	South	Medium	Interior Trail
High Plains Trail	Leash Required	South	Low	Interior Trail
Marshall Lake Lookout	Leash Required	South	Low	Interior Trail
Marshall Mesa TH	Observation	South	High	Trailhead
Marshall Mesa Trail	Observation	South	High	Interior Trail
Marshall Mesa/Community Ditch	Interview	South	High	Interior Trail
Marshall Valley Trail	Both	South	High	Interior Trail
Post Office Access	Leash Required	South	Very Low	Start of Trail
Prairie Vista Trail	Both	South	Medium	Start of Trail
Spring Brook Loop North	Leash Required	South	Medium	Interior Trail

*Both means the site was used for the observation and the interview components

Site Name	Site Type	Trail Study Area	Visitation Volume	Trail Continuum
1st/2nd Flatiron Trail	Interview	West	Medium	Interior Trail
Amphitheater Trail	Both*	West	Medium	Start of Trail
Amphitheater Trail	Leash Required	West	Medium	Start of Trail
Anemone Trail	Both	West	Medium	Interior Trail
Baseline Trail	Interview	West	Medium	Interior Trail
Baseline/Bluebell-Baird	Leash Required	West	Medium	Trailhead
Bear Peak West Ridge/Bear Canyon	Leash Required	West	Medium	Interior Trail
Bluebell - Baird Trail	Both	West	Medium	Interior Trail
Bluebell Road	Both	West	High	Interior Trail
Centennial TH	Both	West	Medium	Trailhead
Chapman TH	Both	West	Low	Trailhead
Chapman Trail	Leash Required	West	Low	Start of Trail
Chautauqua Trail	Interview	West	High	Interior Trail
Contact Corner Trail + Spurs	Both	West	Low	Start of Trail
Crown Rock TH	Observation	West	Medium	Trailhead
Crown Rock Trail	Both	West	Medium	Start of Trail
Dakota Ridge Trail	Leash Required	West	Medium	Start of Trail
Dakota Ridge Trail	Both	West	Medium	Interior Trail
E.M. Greenman	Leash Required	West	Medium	Interior Trail
East Ridge Trail	Both	West	High	Interior Trail
Eldorado Canyon Trail	Leash Required	West	Low	Interior Trail
Enchanted Mesa Trail	Both	West	Medium	Interior Trail
Fern Canyon Trail	Observation	West	Medium	Interior Trail
Fern Meadow - Cragmoor Trail	Observation	West	Low	Start of Trail
Flagstaff Trail	Both	West	Low	Interior Trail

*Both means the site was used for the observation and the interview components

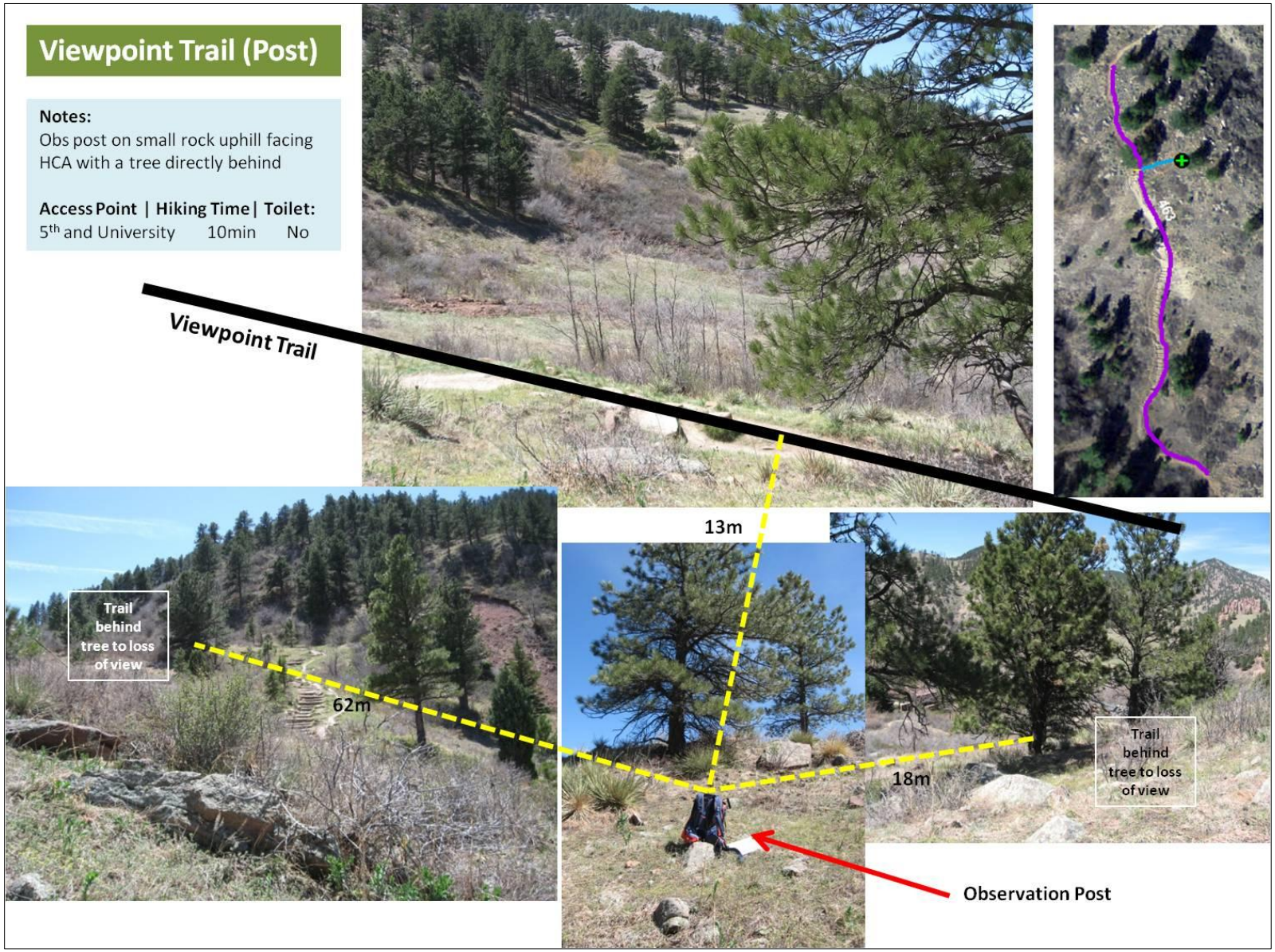
Site Name	Site Type	Trail Study Area	Visitation Volume	Trail Continuum
Flatirons Loop Trail	Both	West	Medium	Interior Trail
Four Pines TH	Both	West	Low	Trailhead
Four Pines Trail	Both	West	Low	Start of Trail
Goat Trail	Observation	West	Low	Start of Trail
Green Mountain West Ridge/Green Bear	Leash Required	West	Medium	Interior Trail
Gregory Canyon Trail	Both	West	Medium	Interior Trail
Homestead Leash Trail	Leash Required	West	Medium	Interior Trail
Homestead Trail	Observation	West	Medium	Interior Trail
Homestead/Mesa Trail	Interview	West	Medium	Interior Trail
Kohler Mesa Trail	Both	West	Low	Interior Trail
Lehigh Connector - South Trail	Both	West	Low	Start of Trail
Lost Gulch Trail	Leash Required	West	Medium	Trailhead
Lower Big Bluestem/Bluestem Connector	Leash Required	West	Low	Interior Trail
Mallory Cave Trail	Both	West	Low	Interior Trail
Mesa/Bear Canyon-NCAR Trail	Interview	West	Medium	Interior Trail
Mesa/Enchanted Mesa	Both	West	Medium	Interior Trail
Mesa/N. Shanahan	Both	West	Medium	Interior Trail
Mt Sanitas Trail	Both	West	High	Start of Trail
Old Mesa Trail	Leash Required	West	Low	Interior Trail
RangeView Trail	Observation	West	Low	Interior Trail
Realization Point TH	Both	West	Low	Trailhead
Red Rocks	Interview	West	High	Interior Trail
Red Rocks Spur Trail	Interview	West	High	Start of Trail
Red Rocks Trail New	Observation	West	High	Start of Trail

*Both means the site was used for the observation and the interview components

Site Name	Site Type	Trail Study Area	Visitation Volume	Trail Continuum
Sanitas Valley Trail	Both	West	High	Interior Trail
Shadow Canyon North	Both	West	Medium	Interior Trail
Shanahan - North Fork	Interview	West	Medium	Interior Trail
Shanahan - South Fork Trail	Observation	West	Medium	Interior Trail
Shanahan Connector	Both	West	Medium	Interior Trail
Shanahan Ridge	Both	West	Medium	Start of Trail
Shanahan -South Fork/Mesa Trail	Interview	West	Medium	Interior Trail
Skunk Canyon Trail	Both	West	Medium	Interior Trail
South Boulder Creek West TH	Both	West	Medium	Trailhead
South Boulder Creek West Trail	Both	West	Medium	Interior Trail
South Mesa TH	Both	West	High	Start of Trail
South Mesa Trail New	Observation	West	High	Interior Trail
South Mesa/Big Bluestem	Interview	West	Medium	Interior Trail
Sunshine Canyon Trail	Both	West	Medium	Interior Trail
Tenderfoot Trail	Both	West	Low	Interior Trail
Upper Chautauqua Trail	Both	West	High	Interior Trail
Ute Trail	Both	West	Low	Interior Trail
Viewpoint TH	Interview	West	Low	Trailhead
Viewpoint Trail	Both	West	Low	Interior Trail

*Both means the site was used for the observation and the interview components

Appendix D1. Voice and Sight regulations component photo site map example showing parameters of site



Appendix D2. Voice and Sight regulations component observation zone parameters

*Obs post names may or may not match to trail names (most likely will match but some exemptions e.g Dakota Ridge Trail (station) includes Dakota Ridge trail and Sanitas Valley trail
= rangefinder unable to lock on target, no number provided

(Obs Post*) Name	Field of View - left side (m), rangefinder target	Field of View - right side (m), rangefinder target	GPS Offset (ft)	GPS Trail width (ft)
Amphitheater Trail	14, rock/loss of view	82, rock in front/behind bush/loss of view	35	13
Anemone Trail	44, tree/loss of view	59, rock/loss of view	119	7
Baseline Trail	19, rock near access point	73, tree/loss of view	39	4
Bluebell - Baird Trail	97, person/loss of view	77, person/loss of view	75	24
Bluebell Road	157, bush/person/loss of view	80, Mesa-tree/loss of view 84, Bluebell-tree in front of road bend/loss of view	96	18
Bobolink Trail New	#, tree/loss of view	65, fence post/loss of view	6	10
Centennial Greenway	#, bridge	#, loss of view/bend	19	11
Centennial TH	27, tree parallel 53, tree/loss of view	71, fire rd/loss of view 70, tree	75	15
Chapman TH	39, leash/VS sign post	80, center of trail/loss of view	7	16
Chapman Trail	#, loss of view	#, loss of view	5	16
Coal Seam Trail	89, tree	139, tree	54	9
Cobalt Trail	141, gate	154, shrub patch left side/ Cobalt Trail 187, shrub patch center trail/Old Mill	207	14

(Obs Post*) Name	Field of View - left side (m), rangefinder target	Field of View - right side (m), rangefinder target	GPS Offset (ft)	GPS Trail width (ft)
Contact Corner Trail + Spurs	#, start of trail/loss of view 61, tree left of trail	62, rock behind tree #, rock/loss of view	17	7
Cottonwood Trail	#, trail line of sight behind tree	#, behind tree/loss of view	33	11
Crown Rock TH	20, tree/loss of view 20, rock/loss of view	59, TH sign 37, bush/loss of view 32, rock/loss of view	8	10
Crown Rock Trail	24, loss of view behind tree	45, loss of view behind tree left of trail	19	6
Dakota Ridge Trail	140, trail sign	204-208, tree 145, fallen tree/rock slide	217	6
Degge Trail	#, 4th pole/rise/loss of view	#, ridge/loss of view	109	7
Doudy Draw TH	51, VS sign post next to bike rack	#, small sign post left side of trail/grassland closure before bend	84	12
Doudy Draw/Community Ditch New	52, metal pole behind restoratio n fence/FOV starts on trail across from fence enclosing toilet	53, sign post on fence/FOV starts at junction near critical wildlife area	40	8
Dry Creek Trail New	#, bend/loss of view	207, tree cluster end of line #, junction/large tree	38	17
Eagle Shelter	#, loss of view	150, tree 102, fence but FOV beyond to large shrub cluster	71	9
Eagle TH	197, rise closest to TH	#, TH gate	23	18
Eagle West New	#, loss of view/Eagle #, shrub behind ramp/Marshall	#, parallel to shrub/HiddenValley #, loss of view 145, TH gate	88	19

(Obs Post*) Name	Field of View - left side (m), rangefinder target	Field of View - right side (m), rangefinder target	GPS Offset (ft)	GPS Trail width (ft)
East Ridge Trail	92, TH sign	94, loss of view/top of ridge	77	10
Enchanted Mesa Trail	129, tree by TH sign	144, rock left side of trail 67, tree @ connector with Mclintock	125	12
Fern Canyon Trail	14, loss of view behind tree	95, tree/loss of view	9	9
Fern Meadow - Cragmoor Trail	82, tree next to brown house	125, rock at junction 145, rock @ start steep trail 105, tree	118	10
Flagstaff Trail	#, loss of view/bend	#, access point/trail start	10	6
Flatirons Loop Trail	95, start of trail past tree in the center	54, steps/loss of view	65	6
Flatirons Vista TH	150, shrub right side of trail	#, rise/loss of view 28, VS dog station/gate	85	31
Flatirons Vista Trail	#, junction/sign post	#, gate	102	11
Foothills Trail	#, fence post	58, tree/behind tree to loss of view	106	9
Footlhills TH New	#, bend/dip/loss of view	165, US 36 underpass/right wall	43	10
Four Pines TH	112, rock in gap between trees	87, farthest bush	138	16
Four Pines Trail	144, tree right side of bench	44, gap between bushes	62	24
Fourmile Creek Greenway	#, loss of view	111, VS sign post left side of trail	3	25
Goat Trail	95, tree 85, tree	80, sign post	6	11
Greenbelt Plateau TH	89, gate	17, trashcan #, 2nd HCA short post	79	13

(Obs Post*) Name	Field of View - left side (m), rangefinder target	Field of View - right side (m), rangefinder target	GPS Offset (ft)	GPS Trail width (ft)
Greenbelt Plateau Trail	#, loss of view	#, 2nd short sign post/center of trail #, loss of view	8	10
Gregory Canyon Trail	#, loss of view	#, loss of view/bend after restoration fence	10	10
Gunbarrel TH	#, rise/loss of view	#, trail behind sign post/follow line of sight #, midway	68	14
Gunbarrel Trail	#, 4th fence post	#, midway (two trails south of main) #, between bottom of trail and next rise	25	14
Hidden Valley Trail	51, bush on right side of trail/loss of view	#, shrub left side of trail bend before straightaway	55	7
Homestead Trail	112, tree on left side of trail	44, tree/bush on right side of trail	52	7
Kohler Mesa Trail	150, gap between trees/loss of view	67, tree @ junction to Enchanted Mesa 107, tree/loss of view	88	18
Lehigh Connector - South Trail	198, tree by fence	#, loss of view	34	7
Mallory Cave Trail	41, large rock	88, rock wall	27	15
Marshall Mesa Trail	149, large tree/loss of view	71, shrub/junction 125, tree left side of trail	173	13
Marshall Mesa TH	193, little tree by large rock	#, restoration fence before bridge 34, TH sign	97	8
Marshall Valley Trail	46, tree	128, shrub left side of trail	36	24

(Obs Post*) Name	Field of View - left side (m), rangefinder target	Field of View - right side (m), rangefinder target	GPS Offset (ft)	GPS Trail width (ft)
Mesa Reservoir Trail	#, tree #, bend/loss of view	#, trail sign at Degge/Hidden Valley junction #, bend/loss of view	99	13
Mesa/Enchanted Mesa	43, tree	101, tree in front view/loss of view 58, diagonal tree	65	12
Mesa/N. Shanahan	71, tree/loss of view 34, tree/Mesa	60, bush/FernCyn #, loss of view/Mesa	18	12
Mt Sanitas Trail	#, loss of view	24, tree on left/loss of view	28	9
North Rim Trail	93, gate	143, shrub middle of bend 44, edge of trail/gate	43	7
Prairie Vista Trail	67, gate	190, 1st shrub/loss of view 72, shrub right side of trail parallel to electric pole	54	7
RangeView Trail	44, short branching tree right side of trail	43, skinny tree	22	6
Realization Point TH	65, tree/loss of view/Tenderfoot #, loss of view/RangeView	54, tree/loss of view/Ute 24, tree by TH sign	26	23
Red Rocks Trail New	129, tree center of trail (FOV starts at first visible log)	134, tree across from trail near start of trail	147	9
Sage TH	#, fence post/coyote sign	113, rise/loss of view	9	21
Sage Trail	110, bush next to trail bend	170, restoration fence	151	15
Sanitas Valley Trail	#, little tree right of trail/loss of view	121, trail sign #, little tree on left of trail/loss of view	27	18
Shadow Canyon North	#, tree/top of ridge/loss of view	109, rocks/trail junction	11	6
Shanahan - South Fork Trail	23, tree left of trail/view in gap	86, tree with fallen branch/loss of view	67	11

(Obs Post*) Name	Field of View - left side (m), rangefinder target	Field of View - right side (m), rangefinder target	GPS Offset (ft)	GPS Trail width (ft)
Shanahan Connector	126, tree/view in gap	100, tree behind bush/loss of view	74	14
Shanahan Ridge	113, tree left of trail/loss of view	138, tree 91, tree	65	15
Skunk Canyon Trail	86, tree left side of trail/loss of view	154, tree right side of trail	62	7
South Boulder Creek at EBCC	117, sign post before bridge #, sign post before Bobolink	#, loss of view	35	12
South Boulder Creek West TH	93, slanted tree 105, skinny tree/loss of view	65, TH sign	10	12
South Boulder Creek West Trail	100, cluster of rocks	#, tree/gate	83	9
South Mesa TH	62, left of trail	39, fence 130, shrub left of trail 43, loss of view	21	17
South Mesa Trail New	31, rock 241, gap between trees	#, gap between rock-bushes 238, rock left of trail	70	13
Sunshine Canyon Trail	120, rocks left of trail/loss of view	70, tree/loss of view	113	6
Teller Farm TH	60, TH sign	154, gap between first and second thick fence posts	339	11
Teller Farm Trail	29, tree/loss of view	40, green fence pole with white tip	19	12
Tenderfoot Trail	149, tree/loss of view	25, bush left of trail	30	3
Upper Chautauqua Trail	82, tree left of trail	149, large rock + trail sign at junction 37, tree left of Bluebell Mesa	116	29
Ute Trail	#, loss of view	#, loss of view	31	7
Viewpoint Trail	62, large tree/trail behind to loss of view	18, tree/trail behind to loss of view	41	11

Appendix E. Field preparation checklist and field protocols

FIELD PREP INSTRUCTIONS

Observation | Leash Interviews | Leash Required

ONE WEEK PREP

1. If needed, reserve OSMP vehicle one week in advance (Ford Escape or Chevy Colorado)
2. If needed, reserve GPS unit one week in advance (preferred order: Butters, Wendy, Kenny, 2xJuno)
   - ☐ Check background files
     - Leash required 2013 yellow
     - VS 2013 red
     - VS 2006 2010 green
     - VS Int 2013 pink
     - VS Int 2006 2010 blue
   - ☐ Check data dictionary: Monitoring VS 2014
3. If needed, print out blank datasheets
   - ☐ **light blue paper** = VISITOR PARTY
   - ☐ **beige paper** = INTERACTION and V&S CONTROL
   - ☐ **white paper** = LEASH INTERVIEW
   - ☐ **light green paper** = LEASH REQUIRED

Behavioral Observation (Wear street clothes!)

Materials/Gear Checklist

- ☐ Data sheets (light blue and beige)
- ☐ Site map
- ☐ Observation post photo map
- ☐ GPS unit (XT or XH)
- ☐ Range finder
- ☐ Binder or clipboard
- ☐ Pencils/pens
- ☐ Stop watch
- ☐ Cripple Creek chair
- ☐ Binoculars
- ☐ Backpack
- ☐ Plastic bag (if needed to protect backpack from rain)

Leash Interviews (Wear uniform!)

Materials/Gear Checklist

- ☐ Data sheets (white)
- ☐ Sitemap
- ☐ GPS unit (XT or XH)
- ☐ Camping table
- ☐ Interview sign
- ☐ Dog biscuits (1 bag)
- ☐ Binder or clipboard
- ☐ Pencils/pens
- ☐ Backpack
- ☐ Plastic bag (if needed to protect backpack from rain)
- ☐ Dog water bowl and gallon of water (For trailhead sites only)

Leash Required (Wear street clothes!)

Materials/Gear Checklist

- ☐ Data sheets (light green)
- ☐ Site map
- ☐ GPS unit (XT or XH)
- ☐ Binder or clipboard
- ☐ Pencils/pens
- ☐ Backpack
- ☐ Kennel Leads
- ☐ Plastic bag (if needed to protect backpack from rain)

General Coding Rules

- All fields must either be checked, have a # or have text
- Codes for each field are provided with the field name. If the field's codes do not apply, use one of the symbols below and at the top left corner of the datasheets.

Symbol	Description	Instruction
X	Missed observation	Use this symbol if you should have recorded something but forgot to write it down or missed something from taking place, e.g. guardian issues a command but you missed seeing the dog's behavior
/	NA	Use this symbol for fields where nothing is expected to happen, e.g. if # of times poop is 0, then pickup and took fields will have "/". Also, use this symbol for fields that are nullified by default. For example, if the event is a pass, no dogA behavior is recorded by default and this field will have "/".
?	Not sure	Use this symbol for fields where you are unsure of what code to use, e.g. the dog goes off-trail and squats but you are unsure if the dog pooped or you are unsure of the dog behavior
_____	Deleted observation	Place a line through a row you want to delete, e.g. visitor party enters and immediately turns around/leaves your observation zone or you record interaction data and realize you're observing the wrong visitor party

Navigating to Observation Posts

Navigate to the assigned observation post using any/all of the following tools: GPS unit, range finder, site map and observation post map

- Use the GPS unit and site map to find the general area where the observation post is located
- Use the range finder and photo map to fine tune the exact location of the observation post and find the boundaries of the observation zone for the post
    - *Reading the photo map:* All photos are shot to reflect the perspective in front of you. Use the photo with the orange and blue hiking pack to locate the observation post. Once you're standing at the post location, hold the map in front of you and match the photos to what you can physically see to orient yourself to the designated field of view. Use the photos on the left and right side to find distinguishing landmarks that mark the end point boundaries for the trail(s). The top photo should match what is directly in front of you.
    - The dotted yellow lines represent your line of sight. If there is a number (in meters) next to the line, use the range finder to find the approximate measurement and fine tune your location.
    - The solid black lines serve as general representations of the trail(s) in the observation zone.

Entering Observation Session Information

Check the table below for determining when to enter the session information in the Visitor Party Data Sheet

1. Check the hourly weather forecast graph on NWS-NOAA website (www.forecast.weather.gov) for weather conditions
2. Enter/check the session information requiring office entry prior to leaving for a monitoring site and record information in these fields
3. If a second session is scheduled for the day, enter/check the session information for the second session prior to leaving for the first session's monitoring site
4. Before a session begins (in the field), enter/check the remaining session information

Field Name/Variable	Format/Options	When to Enter
Date (of the observation session)	mm/dd/yyyy	Office
Location	Site name	Office
Time Period	AM	Office
	Mid-Day	Office
	PM	
Observation Zone	Trailhead: 0-150 ft from access point	Office
	Start of Trail: <0.25 miles from trailhead	
	Interior Trail: >0.25 miles from trailhead	
	10 degree increments (^{o}F)	
Weather: **Temp**	Wind speed (mph) reported by NWS-NOAA for Boulder (hourly weather graph) http://www.weather.gov/	Office
Weather: **Wind**		Office
Closure	Yes	Office
	No	
Start Time	hh:mm (24-hour format)	Field
End Time	hh:mm (24-hour format)	Field
Weather: **Skycover**	Sunny	Field
	Partial Cloudy	
	Overcast	
Weather: **Precip**	Rainy	Field
	Snow	
	None	
	Water	
Challenge for VS Control: Check only if visible/present on observation day	Livestock	Field
	Prairie Dogs	
Observer	Initials	Office/Field

****Once a visitor party is assigned a field number, data sheets should be used simultaneously****

Coding Visitor Party Data Sheet

1 row = 1 visitor party

Leave "Session ID" and "Visitor Party Number" (fields in red) blank (The numbers for these fields will be auto-generated by the database and recorded into the datasheets during data entry)

1. Check direction assignment and wait for a visitor party with one or more dogs off leash
    - Visitor party is any combination of people/dogs that the observer believes is intentionally travelling together
    - Visitor party can consist of both off-leash and on-leash dogs, but NEVER record visitor parties with only leashed dogs
2. When this first visitor party appears in the observation zone, write 1 in "Field VP Number"
    - The observer will watch the visitor party the entire time the party remains in the observation zone.
    - Only one visitor party is observed at a time.
    - Record subsequent parties with 2, 3, 4, 5, etc.
    - If a recorded visitor party re-enters observation zone, do not record again.
    - If a recorded visitor party leaves field of view in less than one minute, strike observation.
3. Record # of people in visitor party and write letter for activity type next to #
    - Include # of babies and young children in carriers/stroller
4. Record # of dogs
    - Include off-leash dogs and on-leash dogs in the same visitor party.
5. Record # of visible leashes
    - Guardian is holding leash or leash is attached to human or human's backpack/other bag.
    - Attached to dog but not held or attached to human.
    - Visible leases DO NOT refer to leashed dogs
6. Record # of on-leash dogs with a VS tag
7. Record # of on-leash dogs without a VS tag
8. Record # of on-leash dogs that you are unsure about VS tag display
9. Record # of off-leash dogs with a VS tag
    - If leash is attached to dog but not held by/attached to owner, dog is considered off-leash.
10. Record # of off-leash dogs without a VS tag
11. Record # of off-leash dogs that you are unsure about VS tag display
12. Record 1 or 0 only if visitor party has 3+ off-leash dogs. Place diagonal slash (/) for parties with 1-2 dogs.
    - 1 = 1human:3dogs / 2human:5dogs/3human:7dogs/ 4human:9dogs
    - 0 = 1human:3dogs (2 dogs off-leash and 1 dog on-leash)
13. Record # of times dogs pooped (include off-leash and on-leash dogs for visitor party under observation)
14. Record 1 or 0 for ALL poop picked up (bag, scoop, container)
15. Record 1 or 0 for ALL poop leaving with guardian immediately when guardian starts walking again after pickup (bag, scoop, container)
16. Record code # if OSMP ranger/staff is physically visible in your observation zone. Record 3 if you do not see a ranger or staff.

17. In the notes field, write weather changes, visitor party characteristics, further details about poop events, OSMP presence outside your observation zone, e.g. ranger car at trailhead.
    - If you don't have any information or details to add, write "No notes"

Specific Reminders about Visitor Party Observations:

A session will be cancelled for one or more of the following reasons:

- Where weather conditions are such that:
    - No visitors could be expected
    - Staff person would be miserable working in those conditions
    - Staff member's health or safety is at risk
    - Conditions prevent the observer from effectively completing the written data sheets
    - Wind speed is greater than 15mph or otherwise makes auditory component difficult to implement
- If the session starts more than 30 minutes past the designated start time, e.g. staff member delays, etc.
- If the session's duration is less than 2 hours for any reason, e.g. weather deteriorates

If the session is at least 2 hours in length but shorter than 3 hours due to inclement weather or unexpected events (but NOT cancelled), document the end time for the session and check the "partial session" checkbox on the top of the Visitor Party datasheet and write a brief description of the reason in the notes section of the last recorded visitor party.

Additional trails that are near the observer, but are geographically behind where the observer would stand to face the observed trail (in monitoring site name), will not be observed. Generally speaking, this means that observers will be observing a field of view spanning approximately 180° equidistant from where they are standing/facing the trail(s) to be observed.

If any visitor party is recognized by the observer on two or more occasions during one monitoring period, and this party would normally be chosen for sampling as outlined in this protocol, this party will be excluded from observation as monitoring staff believe it is possible to remember a visitor party during one 3-hour period. If any visitor party is recognized by the observer during two or more monitoring periods, these parties will be observed as monitoring staff acknowledge the human inability to remember every party observed across 12 weeks, and thus, systematically exclude repeat observations from the sample. The field technician will make a note of a likely repeat observation in that party's "notes" field on the datasheet. Any recognized repeat visitor party is always allowed to be counted as party "B" in relation to the party being observed (party "A").

If a field technician realizes during any observation that the visitor party data he/she initially recorded is not correct (e.g. 3 people thought to be travelling together split apart into distinct parties of 1 and 2 people), he/she will:

- Keep the observation and revise the visitor party data as necessary if no interactions are yet observed
- Strike through the observation and then begin to observe the next visitor party that enters the observation zone if any interaction data has been recorded; any struck data will be

considered invalid and excluded from the study

Field observers will make a concerted effort to avoid any interaction with passing visitor parties. Observers will attempt to not look at, speak to, or in any other way acknowledge passing visitor parties unless doing so would be to address the observer's or a visitor party's safety.

****Once a visitor party is assigned a field number, data sheets should be used simultaneously****

Coding Interaction/V&S Control Data Sheet

1 row = 1 event

Other = person and/or dog not in visitor party under observation, wildlife, livestock

Only off-leash dogs in the visitor party under observation will be recorded in this datasheet

1. Keep track of the field number you assigned to the visitor party under observation. This field number will be used to link the two datasheets.
    - Record in "Field VP number".
2. You will be observing and coding **ALL** off-leash dog(s) in the visitor party under observation but recording 1 event/instance per dog per row. Multiple "Passes" of one "other" type can be recorded in the same row if Dog A passes them in a group.
    - Event = action or action(s) determined by the observer to occur at the same time
        i. For example: several commands given in succession with minimal time lapse is one event
        ii. Commands given by guardians will be differentiated from each other as best as possible by the observer. For this protocol, "one command" will be any one instance of a guardian attempting through verbal or non-verbal means to control their dog. One instance could be a hand gesture combined with one verbal "Stop!" or a series of words such as "Max, stop it, come here" within one breath/expression. If time passes between commands given (expression or gesture ends and another one begins), these will be counted as 2 or more commands (2 or more rows) as determined by the number of attempts by the guardian to control the dog.
        iii. An event can include more than one dog behavior if the "other" response is the same
        iv. An event can include more than one Person B behavior if the people's response is the same
        v. An event can include a 1-n for "other", Dog A behavior, Person B behavior and Dog B behavior if the things are behaving similarly or are responding similarly
        vi. An event can be solely a pass.
    - Interaction and VS Control fields can be recorded simultaneously or separately
        i. For example: a dog is continuing to sniff an area and the guardian says "come"; Dog A interaction field would be "/" and the actual behavior "sniffing" would be recorded in the notes; Observer would record the guardian and dog responses

ii. For example: a dog out of sight with no "other" present in observation zone, code relevant VS control fields and record "/" for interaction fields

3. As the dog(s) in the visitor party move across the observation zone, in general pay attention to the following:
    - Dog passes or interacts with others? (Pass and interaction will be defined below)
    - Dog behavior relating to perceived aggression (see dog behavior list)
    - Behavior of other person upon seeing dog (see person behavior list)
    - Off-trail/on-trail
    - Out of sight
    - Guardian response to dog behavior
    - Guardian commands
    - Dog response to guardian
4. Observe the dog as it travels along the observation zone and determine whether the dog is on-trail or off-trail
5. If dog is **ON-Trail (within 10 feet of trail edge),** follow this coding pattern:
    - Flush/alert distances for depth of field is in effect to determine when to record an interaction event with an "other" physically located off-trail. As the dog travels along the trail (meeting an "other"), record:
        i. Dog and Person/Equestrian
            1. *Directionality*: Dog moves body forward in the direction of the other person or animal
            2. *Eye Gaze:* Dog's head is oriented towards or facing the other person or animal
            3. No Directionality/Eye Gaze = Record "Pass" if within "X" feet of trail edge
            4. Directionality + Eye Gaze + Physical Pass + No behavior = Record "Pass" if within "X" feet of trail edge
            5. Directionality + Eye Gaze + Physical Pass + Behavior = Record "Interact"
            6. Directionality + Eye Gaze + Stop + Behavior = Record "Interact"
        ii. Wildlife and Livestock
            1. No dog behavior (list) = Record "Pass"
            2. Dog Behavior (list) = Record "Interact"
            3. When recording an interaction/pass with a group of wildlife or livestock, the "event" can be recorded in the same row, as long as the behavior of both dog party A and all individual W/L is consistent. In this case, record number of W/L and appropriate letter in same cell; for instance: "25, L" to indicate that a group of 25 livestock were involved.
    - As the dog travels along the trail <u>(without meeting an "other"),</u> record:
        i. Place "/" in all the interaction fields
    - Is the dog out of sight from the guardian? 1=Yes, 0=No
        i. If 1=Yes to "Out of Sight" or the dog exhibits a behavior that the guardian wants to change, does the guardian make an attempt to control the dog in some way, e.g. re-establish line of sight, get the dog's attention, or change the dog's behavior?

        - 0=Guardian makes no attempt to re-establish line of sight to dog
        - 1=Guardian attempts VS commands (voice or sight command such as a hand gesture or clap)
        - 2=Guardian uses alternative ways to control the dog (whistle, clicker, grabs collar, etc.), note what attempt was
    - If a guardian makes a VS attempt as well as an alternative attempt (such as a verbal call and a whistle) in response to the same dog behavior, record as a 3 and note the alternative attempt
        i. If the guardian makes VS attempt, write down the verbal command(s) or describe the sight commands used by the guardian verbatim if possible.
        ii. If the guardian makes an attempt to control the dog's behavior in any way, record the dog's behavior (if dog exhibits series of behaviors, record the behavior that sticks)
            - 0=Dog does not respond to guardian attempt
            - 1=Dog stops behavior and steadily looks at the guardian (Stop + Attn)
            - 2=Dog changes behavior
6. If dog is **<u>OFF-Trail (greater than 10 feet from trail edge),</u>** follow this coding pattern:
    - Once dog goes off-trail, flush distances will not be used
    - Instead, observe the dog for directionality and eye gaze (head orientation) to determine when to record an event.
    - *Directionality*: Dog moves body forward in the direction of the other person or animal
    - *Eye Gaze:* Dog's head is oriented towards or facing the other person or animal
    - If directionality AND eye gaze observed = Record "interact"
        i. Record H, D, W, E or L (H=human, D=dog, W=wildlife, E=equestrian, L=livestock)
        ii. Record physical contact between Dog A and H, D, W, E, or L: 1=Yes, 0=No
        iii. If W, record wildlife behavior
            1. 0=No response
            2. 1=Flee (animal runs away, moves some distance from original standing location)
            3. 2=Alert (signs of alert/vigilance for deer include standing still/freezing, ears straight or forward, head high, neck prominent, eye gaze/head orientation/watching, stops grazing)
            4. 3=Charge (rush forward)

        Note: If W, "Direction" field will always be recorded as "1" to signify that Dog A initiated interaction with wildlife.
        iv. If E, record horse (livestock) and Person B's behavior using W/L and Pbehv codes
        v. If H or D, record direction of interaction
            1. 1=DogA behavior observed first
            2. 2=Other person (not in visitor party under observation) behavior observed first

3. 3=DogB (not in visitor party under observation) behavior observed first

vi. If H, record other person's behavior using person behavior list
vii. Record DogA's behavior to H, D, W, E or L using dog behavior list
1. Record DogA is wearing a VS tag 1=Yes, 0=No
2. Record DogA is off-trail 1=Yes, 0=No
viii. If D, record DogB's behavior (other dog, not in visitor party under observation) using dog behavior list
1. Record DogB is wearing a VS tag 1=Yes, 0=No
2. Record DogB is on-leash 1=Yes, 0=No
ix. Record physical injury occurred during the interaction 1=Yes, 0=No
x. Record relevant VS Control fields as observed
1. If Closure in header is "No", then "Enter closure" is always "/".

- If directionality OR eye gaze OR no behavior observed = Record "pass"
  i. Record "/" in all interaction fields
  ii. Record "/" in Dog A behavior field
  iii. Record Dog A tag, Off-Trail (under "Opportunity heading") as observed
  iv. Record Out of Sight under V/S Control
- Record any command given without an observed pass or interaction
  i. If a command is given without an observed pass or interaction, all fields will be "/" except Dog A behavior, Dog A tag, Off-Trail, Enter closure (dependent on site attributes) and Out of Sight
- If Dog A is recorded as Out of Sight, record Dog A's behavior if you are able to see it; if you cannot see Dog A' s behavior, record "/"

The notes field is separated into two parts: 1] the first part is a checklist that elaborates on the "other" variable called "other (specific)" and 2] a blank field to write down any additional information that. If an H, D, W, E, or L was marked in "other", specify the other by checking the relevant box. For example, if W was recorded and an Abert's Squirrel was involved in the interaction, check the Abert's Squirrel box. If the observer was involved in the interaction, check the observer box. In the blank field, write down any additional details about interactions and/or commands that might add clarity to the variables already collected.

- Write down dog behaviors that are not listed in the dog behavior list but prompts a guardian response (i.e. verbal command), e.g. sniffing
- If you don't have any information or details to add, write "No notes"

Note: In any instance, if an event is recorded as "P," (for Presence), then by default all fields designated under the "interactions" heading are NOT applicable, as well as "Dog A ABC" field under the "Opportunity" heading.

Additionally, in the event of a "P" (Pass), fields under "Voice and Sight Control" heading can be recorded as follows:

- "Enter Closure" field can be recorded as a 1 or 0, where 1=yes, and 0=no, or "/" where applicable.
- "Out of Sight" can be recorded as a 1 or 0, where 1=yes, and 0=no.

- If “Guardian Response” field is recorded as a 0, then “Command,” “Hear,” and “Dog A Response” fields will be recorded as N/A.

Specific Reminders about Interaction/VS Control Observations:

- Commands given by guardians will be differentiated from each other as best as possible by the observer. For this protocol, “one command” will be any one instance of a guardian attempting through verbal or non-verbal means to control their dog. One instance could be a hand gesture combined with one verbal “Stop!” or a series of words such as “Max, stop it, come here” within one breath/expression. If time passes between commands given (expression or gesture ends and another one begins), these will be counted as 2 or more commands as determined by the number of attempts by the guardian to control the dog.

- Field technicians will not record guardians “talking” to their dogs. Some examples of talking which would not be recorded are:
  - “It’s ok”
  - “Where are you going boy?!”
  - “What a good girl!”
  - “Lucius, you’re embarrassing me!”

- We are not documenting attributes or commands for guardian B.

Appendix F. Voice and Sight regulations component datasheets

Voice and Sight Tag Project Monitoring Data Sheet: VISITOR PARTY* (Observation of visitor parties with 1+ off-leash dogs)

Session ID:	Date (mm/dd/yy):	Location:	Observation Zone: ☐ Trailhead ☐ Start of Trail ☐ Interior
Start Time (24-hour):	End Time (24-hour):	Time Period: ☐ AM ☐ Mid-Day ☐ PM ☐ Partial Session	Challenge for VS Control: ☐ Water ☐ Livestock ☐ Prairie Dogs ☐ None
Skycover: ☐ Sunny ☐ P Cloudy ☐ Overcast	Temp: ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☑ 80 ☐ 90 ☐ 100	Precip: ☐ None ☐ Rain ☐ Snow	Wind (m/h): / Closure: ☐ YES ☐ NO / Observer:

Visitor Party Number	Field VP Number	Visitor party data										Excrement			OSMP presence	NOTES
		People (#1-n), incl activity type H R B E C O combined with #	Dogs #1-n	Visible leashes #0-n	Leash with tag #0-n	Leash no tag #0-n	Leash tag unsure #0-n	Off leash with tag #0-n	Off leash no tag #0-n	Off leash tag unsure #0-n	More than 2 dogs off leash Y=1 N=0	Poop: # of times, 0-n	Pick up ALL Y=1 N=0	Took ALL bag Y=1 N=0	0=No R/S 1=Ranger 2=Staff	include change in weather, visitor party characteristics, off-leash/on-leash dog poop, etc.

Label	Description	Code	Code Definitions
Session ID	Session number assigned by Access upon data entry	1-n	No code definition
Date	Date of observation session	mm/dd/yy	No code definition
Location	OSMP trail name	ABC	No code definition
Skycover	Skycover condition for observation session	Sunny	Clear skies, sun overhead
		Partial Cloudy	Some clouds
		Overcast	No sun
Temperature	Temperature at start of observation session	40-n (^{o}F)	In 10^{o} increments
Precipitation	Precipitation for observation session	None	No rain or snow visible in air
		Rain	Water droplets falling down
		Snow	Snow flakes falling down
Wind	Wind activity for observation session	1-n (mph)	# forecasted on NWS-NOAA website for Boulder at designated start time
Start Time	Start time when observer reaches the observation zone and observation period begins	hh:mm	24-hour format
End Time	End time when last visitor party under observation leaves the observation zone and observation period ends	hh:mm	24-hour format
Observation Zone	Physical location along the trail where the observer is posted	Trailhead	Within 150 feet of OSMP access point/trail start
		Start of Trail	Greater than 150 feet up to one quarter mile interior from OSMP access point/trail start
		Interior Trail	Anywhere along the trail which is greater than one quarter mile interior from OSMP access point/trail start

Label	Description	Code	Code Definitions
Challenge for VS Control	Challenges for dogs that may impact guardian's ability to use voice and sight control	Water	If checked, standing water (e.g. canal, stream, pool, etc.) is visible in the observer's field of view on observation day
		Livestock	If checked, there are livestock (i.e. cows) grazing within the observer's field of view on observation day
		Prairie Dogs	If checked, there are prairie dogs and/or prairie dog colony within the observer's field of view on observation day
		None	No challenges observed during observation session
Closure	Permanent and/or seasonal closures in effect within observation zone	0	0=No, No closure
		1	1=Yes, Closure in effect
Time period	Time period for observation session	AM	7-11 AM
		Mid-Day	11:30 AM - 3:30 PM
		PM	4-8 PM
Observer	Initials of observer for observation session	ABC	No code definition
Visitor Party Number	Visitor party number generated by MS Access upon data entry	1-n	No code definition
Field VP Number	Visitor party number assigned by observer on day of observation	1-n	No code definition
People	# of people in visitor party (visitor party defined by any combination of people/dogs that the observer believes is intentionally travelling together)	1-n	No code definition
Activity Type	Type of recreation activity	H	Hiking
		R	Running
		B	Biking

Label	Description	Code	Code Definitions
		E	Horseback riding (equestrian)
		C	Climbing
		O	Other
Dogs	# of dogs in visitor party (visitor party defined by any combination of people/dogs that the observer believes is intentionally travelling together)	1-n	No code definition
Visible leashes	# of leashes held by people in the visitor party under observation that is not attached to any dog or if attached to any dog not held by people; BRC 6.1.2 "Leash" means a chain, rope, cord, or strap with a clip or snap for rapid attachment to a choke chain, collar, or harness, all the parts of which are of sufficient strength to hold at least four times the weight of the dog and are suitable for walking the dog and controlling it	0-n	No code definition
Leashed thru entire area with tag	# of dogs in visitor party on leash throughout the entire observation zone with VS tag	0-n	No code definition
Leashed no tag	# of dogs in visitor party on leash throughout the entire observation zone, NO VS tag	0-n	No code definition
Leashed unsure	# of dogs in visitor party on leash throughout the entire observation zone, observer is not sure the dog is wearing a VS tag	0-n	No code definition
Off leash with tag	# of dogs in visitor party off leash with VS tag	0-n	No code definition
Off leash no tag	# of dogs in visitor party off leash, NO VS tag	0-n	No code definition
Off leash unsure	# of dogs in visitor party off leash, observer is not sure dog is wearing a VS tag	0-n	No code definition
More than 2 dogs off leash	Visitor party exceeds person:dog ratio of 1:2 where more than 2 dogs are off leash	1, 0	1=Yes, 0=No

Label	Description	Code	Code Definitions
# of times poop	# of times dog(s) in visitor party pooped	0-n	No code definition
Pick up ALL	Guardian picks up (bag/scooper/container/etc) ALL the dog poop excreted by dog(s) in visitor party	0	0=No, Guardian does NOT pick up any dog poop or sometimes picks up dog poop
		1	1=Yes, Every time dog poops, guardian picks up
Took ALL	ALL contained excrement (poop in bag, scooper, container, etc.) leaves with guardian	0	0=No, Guardian does NOT take any contained excrement or takes away some bags but leaves other bags behind
		1	1=Yes, ALL contained excrement leaves with the guardian
OSMP presence in observation zone	OSMP staff or ranger is present in observation zone while visitor party is under observation	0	No ranger or OSMP staff
		1	Ranger is present in observation zone
		2	OSMP staff (anyone wearing clothing with OSMP logo, includes volunteers) other than rangers present in observation zone

2013 Voice and Sight Monitoring Data Sheet: INTERACTIONS and V&S CONTROL (observation of visitor parties with 1+ off-leash dogs)

Date (mm/dd/yy):	Closure: ☐ Yes ☐ No	Time Period: ☐ AM ☐ Mid-Day ☐ PM	Location:	Obs Zone: ☐ Trailhead ☐ Start of Trail ☐ Interior	Observer:

		Opportunity					Interactions (Dog A = off-leash dogs in visitor party under observation)								Voice & Sight Control					
Field VP Number	Event Number	Pass or Interact (select one) P=Pass I=Interact	Other # and (select one) H-D-W-L-E	# and Dog A ABC	Dog A tag Y=1 N=0	Off Trail Y=1 N=0	Contact Y=1 N=0	WL Behv 0=No R 1=Flee 2=Alert 3=Charge	Direction 1=DogA 2=Person 3=DogB	# and PBehv ABC	# and Dog B ABC	Dog B tag Y=1 N=0	Dog B Leash Y=1 N=0	Injury Y=1 N=0	Enter Closure Y=1 N=0	Out of Sight Y=1 N=0	Guardian Response 0=No attmpt 1=VS attmpt 2=Alt attmpt 3=VS+Alt	Command (verbatim if possible)	Hear Y=1 N=0	Dog A Response 0=No R 1=Stop+Attn 2=Change
Other specific (select one):			☐ Observe	☐ Bird ☐ Rabbit	☐ Prairie Dog ☐ Deer		☐ Fox Squirrel ☐ Pine Squirrel			☐ Abert's Squirrel ☐ Other	Notes:									
Other specific (select one):			☐ Observe	☐ Bird ☐ Rabbit	☐ Prairie Dog ☐ Deer		☐ Fox Squirrel ☐ Pine Squirrel			☐ Abert's Squirrel ☐ Other	Notes:									
Other specific (select one):			☐ Observe	☐ Bird ☐ Rabbit	☐ Prairie Dog ☐ Deer		☐ Fox Squirrel ☐ Pine Squirrel			☐ Abert's Squirrel ☐ Other	Notes:									
Other specific (select one):			☐ Observe	☐ Bird ☐ Rabbit	☐ Prairie Dog ☐ Deer		☐ Fox Squirrel ☐ Pine Squirrel			☐ Abert's Squirrel ☐ Other	Notes:									
Other specific (select one):			☐ Observe	☐ Bird ☐ Rabbit	☐ Prairie Dog ☐ Deer		☐ Fox Squirrel ☐ Pine Squirrel			☐ Abert's Squirrel ☐ Other	Notes:									
Other specific (select one):			☐ Observe	☐ Bird ☐ Rabbit	☐ Prairie Dog ☐ Deer		☐ Fox Squirrel ☐ Pine Squirrel			☐ Abert's Squirrel ☐ Other	Notes:									
Other specific (select one):			☐ Observe	☐ Bird ☐ Rabbit	☐ Prairie Dog ☐ Deer		☐ Fox Squirrel ☐ Pine Squirrel			☐ Abert's Squirrel ☐ Other	Notes:									
Other specific (select one):			☐ Observe	☐ Bird ☐ Rabbit	☐ Prairie Dog ☐ Deer		☐ Fox Squirrel ☐ Pine Squirrel			☐ Abert's Squirrel ☐ Other	Notes:									
Other specific (select one):			☐ Observe	☐ Bird ☐ Rabbit	☐ Prairie Dog ☐ Deer		☐ Fox Squirrel ☐ Pine Squirrel			☐ Abert's Squirrel ☐ Other	Notes:									
Other specific (select one):			☐ Observe	☐ Bird ☐ Rabbit	☐ Prairie Dog ☐ Deer		☐ Fox Squirrel ☐ Pine Squirrel			☐ Abert's Squirrel ☐ Other	Notes:									

Label	Description	Code	Code Definitions
Date	Date of observation session	mm/dd/yy	No code definition
Location	OSMP trail name	ABC	No code definition
Observation Zone	Physical location along the trail where the observer is posted	Trailhead	Within 150 feet of OSMP access point/trail start
		Start of Trail	Greater than 150 feet up to one quarter mile interior from OSMP access point/trail start
		Interior Trail	Anywhere along the trail which is greater than one quarter mile interior from OSMP access point/trail start
Closure	Permanent (e.g. dog prohibited areas) and/or seasonal closures in effect within observation zone	0	0=No, No closures
		1	1=Yes, Closures in effect
Time period	Time period for observation session	AM	7-11 AM
		Mid-Day	11:30 AM - 3:30 PM
		PM	4-8 PM
Observer	Initials of observer for observation session	ABC	No code definition
Field VP Number	Visitor party number assigned by observer on day of observation; find number on visitor party form for the specific session	1-n	No code definition
Event Number	Number assigned by observer for each row by visitor party; counting sequence restarts to 1 for each visitor party	1-n	No code definition
Pass or Interact	Is the event a pass or interaction? Pass or Interact is dependent on whether the dog is off or on trail. If a dog is off or on trail, an interaction occurs if the dog exhibits both directionality and eye gaze towards the other. The absence of this combination is indicative of a pass. If the dog is on trail and there is another present (human, dog, wildlife, livestock), a pass is designated if the dog does not exhibit behavior towards the other spatially located within the specified distances (general description, see coding protocol for detailed instructions)	P	Pass
		I	Interact
#	Who is the "other" that the dog is either passing or interacting with?	#	# of other(s)
Other		H	Human

Label	Description	Code	Code Definitions
		D	Dog
		W	Wildlife
		L	Livestock
		E	Equestrian (Horse+Rider)
WLBehv	Observed wildlife/livestock behavior towards dog presence/activity	0	No response
		1	1=flee, wildlife is observed fleeing/moving away; displaced from original location
		2	2=alert, wildlife exhibits alert behaviors that may include vocalizations
		3	3=charge; wildlife charges towards dog/visitor party
Contact	Physical contact observed between dog and person/animal	0	0=No, no physical contact observed
		1	1=Yes, physical contact observed
Direct	Direction of interaction: In dog-person or dog-dog interaction, the person or dog who was first observed to display a combination of interaction cues (orientation and gaze, direction and gaze or all three)	1	Dog A
		2	Person B
		3	Dog B
#	DogA's (in visitor party) observed behavior toward person/animal	1-n	# of dogs observed doing the behavior below or if involved in a pass
DogA		Z	No behavior observed
		J	Jumping/pawing
		C	Charging/chasing
		A	Aggression display
		B	Barking
		P	Play signals
TagA	Dog A wearing VS tag	0	0=No, Dog A does not have a VS tag
		1	1=Yes, Dog A has a VS tag

Label	Description	Code	Code Definitions
Off Trail	Dog A is off trail (off trail is the area beyond an unmarked 10ft buffer on either side of the trail)	0	0=No, Dog A is not off trail
		1	1=Yes, Dog A is off trail
#	Person's (NOT in visitor party) response to DogA behavior	#	# of person(s) responding to Dog A behavior
Pbehv		Z	No behavior observed
		V	Verbal invitation
		P	Physical invitation
		A	Avoidance
		N	Verbal protest
		S	Physical protest
#	What is DogB's (NOT in visitor party) observed behavior towards DogA (in visitor party)?	#	# of dog(s) responding to DogA behavior
Dog B		Z	No behavior observed
		J	Jumping/pawing
		C	Charging/chasing
		A	Aggression display
		B	Barking
		P	Play signals
Tag B	Dog B wearing VS tag	0	0=No, DogB does not have a VS tag
		1	1=Yes, DogB has a VS tag on collar
Dog B Leash	Dog B on leash	0	0=No, DogB is off leash
		1	1=Yes, Dog B is on leash
Injury	Interaction between DogA and person/animal (NOT in visitor party) result in injury?	0	0=No, no injury is observed between parties
		1	1=Yes, interaction results in injury
Out of Sight	Is Dog A within the guardian's 360 degree field of view?	0	0=No, Dog A is within guardian's view
		1	1=Yes, Dog A is not within guardian's view
Guard	What is the guardian's response to the dog interaction?	0	No attempt
		1	VS attempt (vocal and/or hand gestures)
		2	Alternative attempt (whistle, treat, clicker)

Label	Description	Code	Code Definitions
		3	VS and Alt (combination of VS and alternative attempts)
Command	Command given by guardian (verbatim)	ABC	Write voice commands verbatim if possible, describe other commands not VS
Hear	Is the guardian's voice audible to the observer?	0	0=No, observer can hear guardian's voice
		1	1=Yes, observer cannot hear guardian's voice
Dog Response	Dog response to guardian command	0	No response
		1	Stop and attention
		2	Change behavior

Appendix G: Leash Interview component datasheet

2014 Voice and Sight Monitoring Data Sheet - Visitor Party for Leash Interview (visitor parties with 1+ off-leash dogs)

Session ID:	Date (mm/dd/yy):	Interviewer:	☐ Partial Session	Obs Zone: ☐ Trailhead ☐ Start of Trail ☐ Interior Trail
Start Time (24hr):	End Time (24hr):	Time Period: ☐ AM ☐ Mid-Day ☐ PM	Location:	
Skycover: ☐ Sunny ☐ P Cloudy ☐ Overcast	Precip: ☐ None ☐ Rain ☐ Snow	Wind (m/h):	Temp: ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90 ☐ 100	

Visitor Party Number	Field VP Number	People (#1-n), incl activity type H R B E C O combined with #	Dogs (1-n)	Leashed with tag (0-n)	Leashed no tag (0-n)	Leashed unsure (0-n)	Off leash with tag (0-n)	Off leash no tag (0-n)	Off leash unsure (0-n)	Visible leashes (0-n)	Stop 0=No 1=Yes 2=Refuse	Show leash 0=No 1=Yes	Leashes shown (0-n)	Notes (include ranger presence Y=1/N=0)	Ranger

Label	Description	Code	Code Definitions
Session number	Leash interview session number assigned by Access upon data entry	1-n	No code definition
Date	Date of leash interview	mm/dd/yy	No code definition
Location	OSMP trail name	ABC	No code definition
Observation zone	Physical location along the trial where observer is posted	Trailhead	Within 150 feet of OSMP access point/trail start
		Start of Trail	Greater than 150 feet up to one quarter mile interior from OSMP access point/trail start
		Interior Trail	Anywhere along the trail which is greater than one quarter mile interior from OSMP access point/trail start
Skycover	Sky cover condition for observation session	Sunny	Clear skies, sun overhead
		Partial Cloudy	Some clouds
		Overcast	No sun
Temperature	Temperature at start of observation session	40-n (^{o}F)	In 10^{o} increments
Precipitation	Precipitation for observation session	None	No rain or snow visible in air
		Rain	Water droplets falling down
		Snow	Snow flakes falling down
Wind	Wind activity for observation session	1-n (mph)	# forecasted on NWS-NOAA website for Boulder at designated start time
Start Time	Start time when observer reaches the observation zone and observation period begins	hh:mm	24-hour format
End Time	End time when last visitor party under observation leaves the observation zone and observation period ends	hh:mm	24-hour format
Time period	Time period for observation session	AM	7-11 AM
		Mid-Day	11:30 AM - 3:30 PM
		PM	4-8 PM
Interviewer	Initials of interviewer	ABC	No code definition

Label	Description	Code	Code Definitions
Visitor Party Number	Visitor party number generated by MS Access upon data entry	1-n	No code definition
Field VP Number	Visitor party number assigned by observer on day of observation	1-n	No code definition
People	# of people in visitor party (visitor party defined by any combination of people/dogs that the observer believes is intentionally travelling together)	1-n	No code definition
Activity Type	Type of recreation activity	H	Hiking
		R	Running
		B	Biking
		E	Horseback riding (equestrian)
		C	Climbing
		O	Other
Dogs	# of dogs in visitor party (visitor party defined by any combination of people/dogs that the observer believes is intentionally travelling together)	1-n	No code definition
Leashed thru entire area with tag	# of dogs in visitor party on leash throughout the entire observation zone with VS tag	0-n	No code definition
Leashed no tag	# of dogs in visitor party on leash throughout the entire observation zone, NO VS tag	0-n	No code definition
Leashed unsure	# of dogs in visitor party on leash throughout the entire observation zone, observer is not sure the dog is wearing a VS tag	0-n	No code definition
Off leash with tag	# of dogs in visitor party off leash with VS tag	0-n	No code definition
Off leash no tag	# of dogs in visitor party off leash, NO VS tag	0-n	No code definition
Off leash unsure	# of dogs in visitor party off leash, observer is not sure dog is wearing a VS tag	0-n	No code definition

Label	Description	Code	Code Definitions
Visible leashes	# of leashes held by people in the visitor party under observation that is not attached to any dog or if attached to any dog not held by people; BRC 6.1.2 "Leash" means a chain, rope, cord, or strap with a clip or snap for rapid attachment to a choke chain, collar, or harness, all the parts of which are of sufficient strength to hold at least four times the weight of the dog and are suitable for walking the dog and controlling it	0-n	No code definition
Stop	Guardian stops or does not stop to be interviewed	0	0=No, Guardian does not stop for interview
		1	1=Yes, Guardian stops to be interviewed
		2	2=Refuse, Guardian refuses interview
Show leash	Does guardian show interviewer a leash for each dog off-leash?	0	0=No, Guardian does not show interviewer leash(es)
		1	1=Yes, Guardian shows interviewer leash(es)
Leashes shown	# of leashes shown to interviewer	0-n	No code definition

Appendix H: Leash required component datasheet

2013 Voice and Sight Monitoring Data Sheet - Visitor Party for Leash Required Trails											
Session ID:		**Date (mm/dd/yy):**		**Observer:**		☐ Partial Session		**Obs Zone:** ☐ Trailhead ☐ Start of Trail ☐ Interior Trail			
Start Time (24hr):		**End Time (24hr):**		**Time Period:** ☐ AM ☐ Mid-Day ☐ PM				**Location:**			
Skycover: ☐ Sunny ☐ P Cloudy ☐ Overcast		**Precip:** ☐ None ☐ Rain ☐ Snow		**Wind** (m/h):				**Temp:** ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90 ☐ 100			
Visitor Party Number	Field VP Number	People (#1-n), incl activity type H R B E C O combined with #	Dogs (1-n)	Leashed with tag (0-n)	Leashed no tag (0-n)	Leashed unsure (0-n)	Off leash with tag (0-n)	Off leash no tag (0-n)	Off leash unsure (0-n)	**Notes** (include ranger presence in the area Y=1/N=0)	Ranger

Label	Description	Code	Code Definitions
Date	Date of observation session	mm/dd/yy	No code definition
Location	OSMP trail name	ABC	No code definition
Observation Zone	Physical location along the trail where the observer is posted	Trailhead	Within 150 feet of OSMP access point/trail start
		Start of Trail	Greater than 150 feet up to one quarter mile interior from OSMP access point/trail start
		Interior Trail	Anywhere along the trail which is greater than one quarter mile interior from OSMP access point/trail start
Skycover	Sky cover condition for observation session	Sunny	Clear skies, sun overhead
		Partial Cloudy	Some clouds
		Overcast	No sun
Temperature	Temperature for observation session	40-n (^{o}F)	In 10^{o} increments
Precipitation	Precipitation for observation session	None	No rain or snow visible in air
		Rain	Water droplets falling down
		Snow	Snow flakes falling down
Start Time	Start time when observer reaches the observation zone and observation period begins	hh:mm	24-hour format
End Time	End time when last visitor party under observation leaves the observation zone and observation period ends	hh:mm	24-hour format
Wind	Wind activity for observation session	1-n (mph)	# forecasted on NWS-NOAA website for Boulder at designated start time
Time period	Time period for observation session	AM	7-11 AM
		Mid-Day	11:30 AM - 3:30 PM
		PM	4-8 PM
Observer	Initials of observer for observation session	ABC	No code definition
Visitor Party Number	Visitor party number generated by MS Access upon data entry	1-n	No code definition

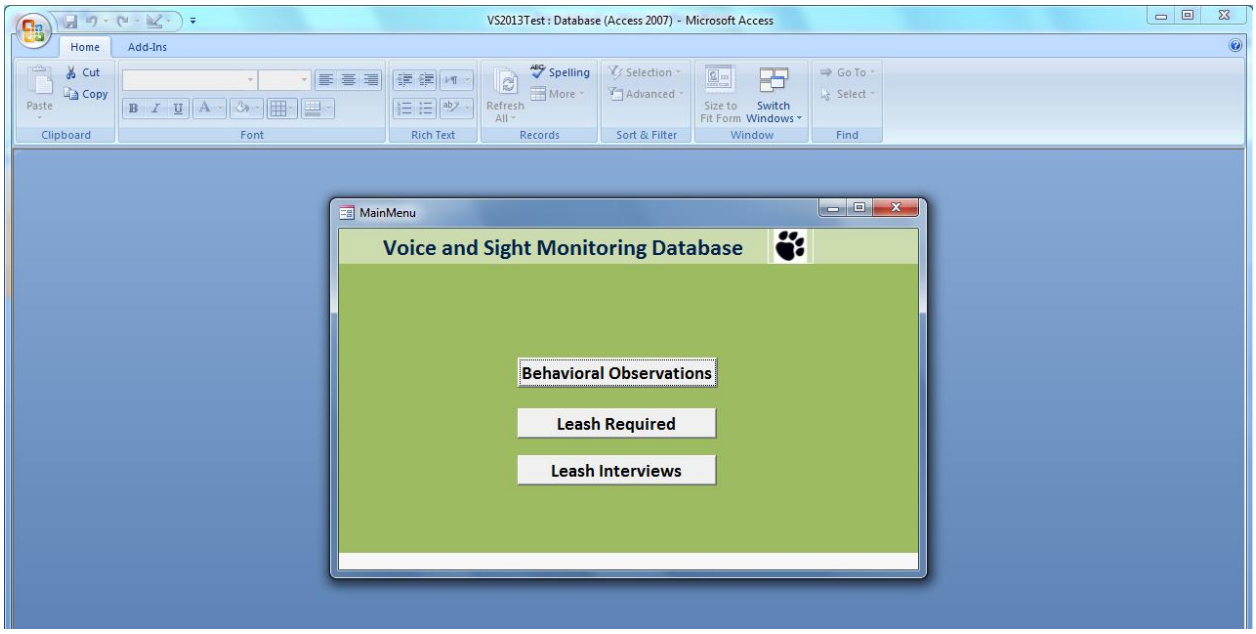
Label	Description	Code	Code Definitions
Field VP Number	Visitor party number assigned by observer on day of observation	1-n	No code definition
People	# of people in visitor party (visitor party defined by any combination of people/dogs that the observer believes is intentionally travelling together)	1-n	No code definition
Activity Type	Type of recreation activity	H	Hiking
		R	Running
		B	Biking
		E	Horseback riding (equestrian)
		C	Climbing
		O	Other
Dogs	# of dogs in visitor party (visitor party defined by any combination of people/dogs that the observer believes is intentionally travelling together)	1-n	No code definition
Leashed thru entire area with tag	# of dogs in visitor party on leash throughout the entire observation zone with VS tag	0-n	No code definition
Leashed no tag	# of dogs in visitor party on leash throughout the entire observation zone, **NO** VS tag	0-n	No code definition
Leashed unsure	# of dogs in visitor party on leash throughout the entire observation zone, observer is not sure the dog is wearing a VS tag	0-n	No code definition
Off leash with tag	# of dogs in visitor party off leash with VS tag	0-n	No code definition
Off leash no tag	# of dogs in visitor party off leash, **NO** VS tag	0-n	No code definition
Off leash unsure	# of dogs in visitor party off leash, observer is not sure dog is wearing a VS tag	0-n	No code definition

Appendix I. Detailed data entry procedures

Opening the Access database file

Go to E:\Database\VoiceAndSight\VoiceAndSight2014.accdb

File name: **VoiceAndSight2014.accdb** (the user interface for data entry is MS Access 2007; the data is stored in SqlServer). Your user interface should look like the picture below. This is the main menu of the database.



General Reminders

- On datasheets, observers could use four general field values in addition to the codes assigned to respective fields. Three of these general field values will be entered into the database: /=NA, ?=not sure and X=missing observation. Any field with a horizontal line through it (=delete observation) will NOT be entered into the database.
- Adding a new record automatically saves the previously entered record. There are three ways to manually save your work: CTRL+S, Click the "disk" icon next to the MS office button on top left hand corner, or hover your mouse over the tab of the form you're working on and right click on the mouse and save.
- To see a complete description of a particular field including the possible values that can be entered, click on the textbox of interest and look at the bottom left hand corner of the screen (above the windows start button).
- Navigation buttons: Left arrow (previous record), Right arrow (next record) and "Add New" (new record). ***There are also navigation buttons at the bottom of each form next to "record" and "search"
- Toggle buttons with form labels will open/close sub-forms within the main forms.

- **Behavioral Observations** = 1 main form and 2 nested forms (Visitor Party and Interactions). Make sure that the Session # (green form and blue form) and Visitor party # (blue form and yellow form) match up as you navigate between forms. Check to make sure the numbers you see in Access also match the numbers on the datasheets for Session ID and Visitor party number. (Also match these numbers to the Field VP Number on the Interactions/VS Control datasheet).
- **Leash Interviews** = 1 main form and 1 nested form (Leash Interviews). Make sure that the Leash interview session # (blue form) and Session # (yellow form) match up as you navigate between forms. Check to make sure the numbers you see in Access also match the numbers on your data sheet for Session ID and Visitor Party Number.
- **Leash Required** = 1 main form and 1 nested form (Leash Required Visitor Party). Make sure that the Leash required session # (light red form) and Session # (yellow form) match up as you navigate between forms. Check to make sure the numbers you see in Access also match the numbers on your data sheet for Session ID and Visitor Party Number.

General Structure of the Database

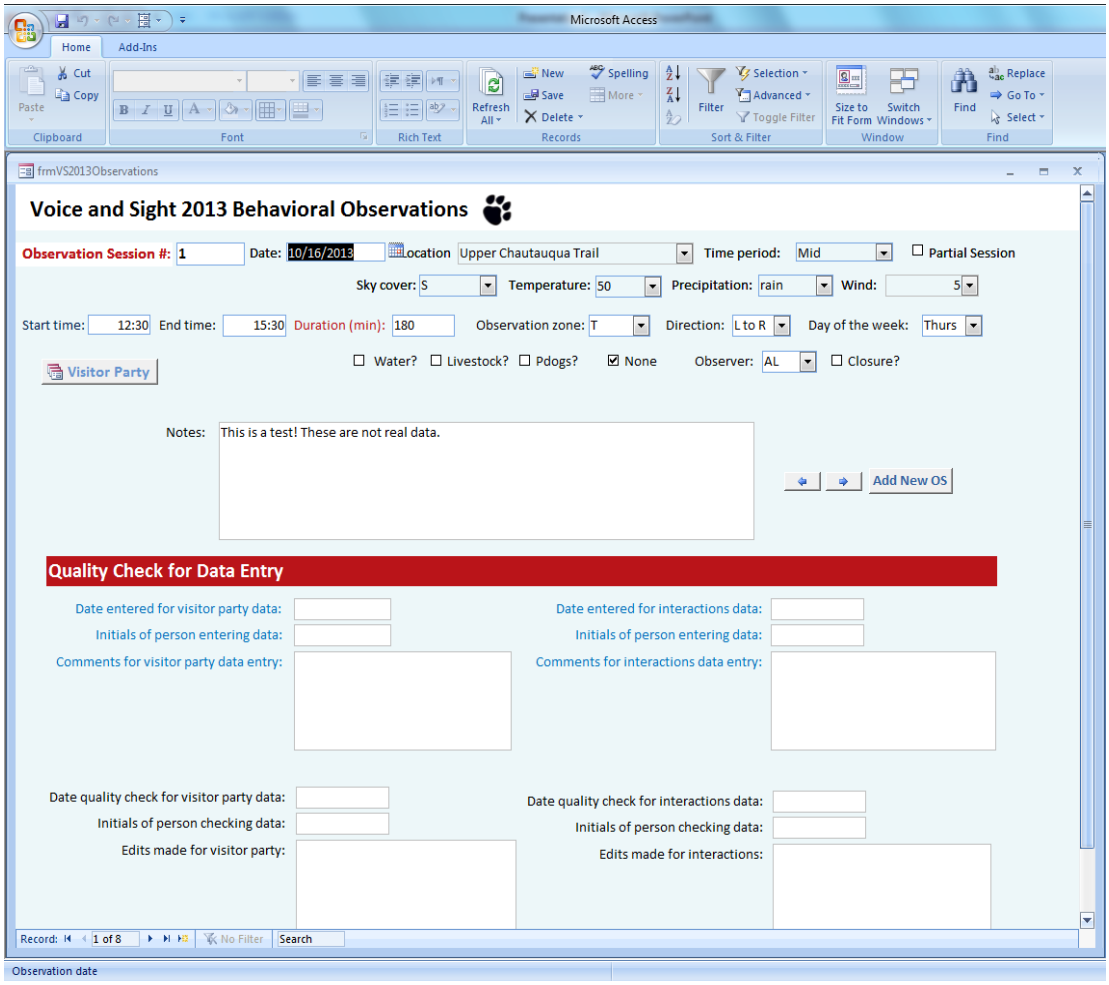
Three main forms will be used for entering and editing data. There are sub-forms in the main forms that are accessible by clicking the respective buttons. The main forms for entering and editing data are **Behavioral Observations**, **Leash Interviews**, and **Leash Required**. There are nested sub-forms in these main forms. Here is a structure of the main forms, sub-forms and associated datasheets.

1. **Behavioral Observations (Light Green Background)**
   - *Associated sub-forms*
     Visitor Party sub-form (yellow background)
     Interactions sub-form (light red background)
   - *Associated datasheets:*
     Visitor Party (light blue datasheet)
     Interactions and Commands (beige datasheet)
2. **Leash Interviews (Blue Background)**
   - *Associated sub-form*
     Leash Interviews: Visitor Party sub-form (yellow background)
   - *Associated datasheet:*
     Leash Interview (white datasheet)
3. **Leash Required (Light Red Background)**
   - *Associated sub-form*
     Leash Required: Visitor Party sub-form (yellow background)
   - *Associated datasheet:*
     Leash Required (Light green datasheet)

Entering Data for Behavioral Observations

Click on “Behavioral Observations” button in the main menu. First, input observation session information (header fields on top of the visitor party datasheet). Then, input the visitor party information. After the visitor party, input the interactions and commands.

Main Form: Behavioral Observations



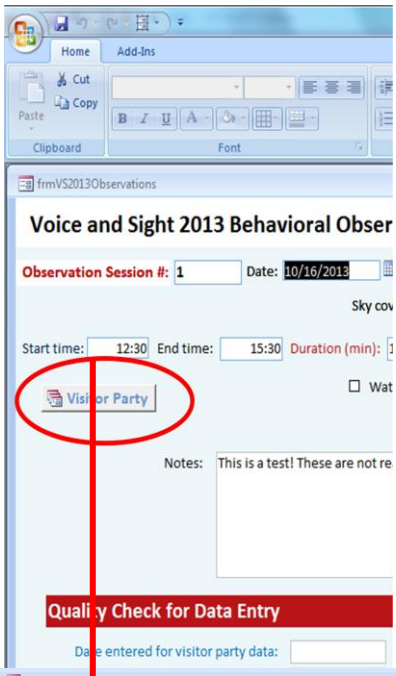
[In Access] Before entering new observation session information, make sure you are entering data in a new record. Use the navigation keys (left arrow, right arrow, “Add New OS”) to go to the next record, previous record or add a new record. Clicking on “Add New OS” will automatically generate a new record. In a new record, you should see “(new)” next to Observation Session #. Do not enter anything in Observation Session # and duration (minutes). These fields (in red) are automatically generated. The Observation Session # will automatically substitute (new) with a number once data has been entered in the other fields or when you leave the record by using the navigation buttons. Begin entering data with “Date.” Clicking on the date field will produce a calendar icon to the right of the field where you can search for a specific date. Duration (min) will be auto-calculated using the data entered for Start Time and End Time. Fill in the rest of the fields by accessing the drop down lists or check the boxes at the top of the

form (all fields above the Quality Check for Data Entry). To facilitate data entry, the [tab] key can be used to go to the next field without clicking on it with the mouse.

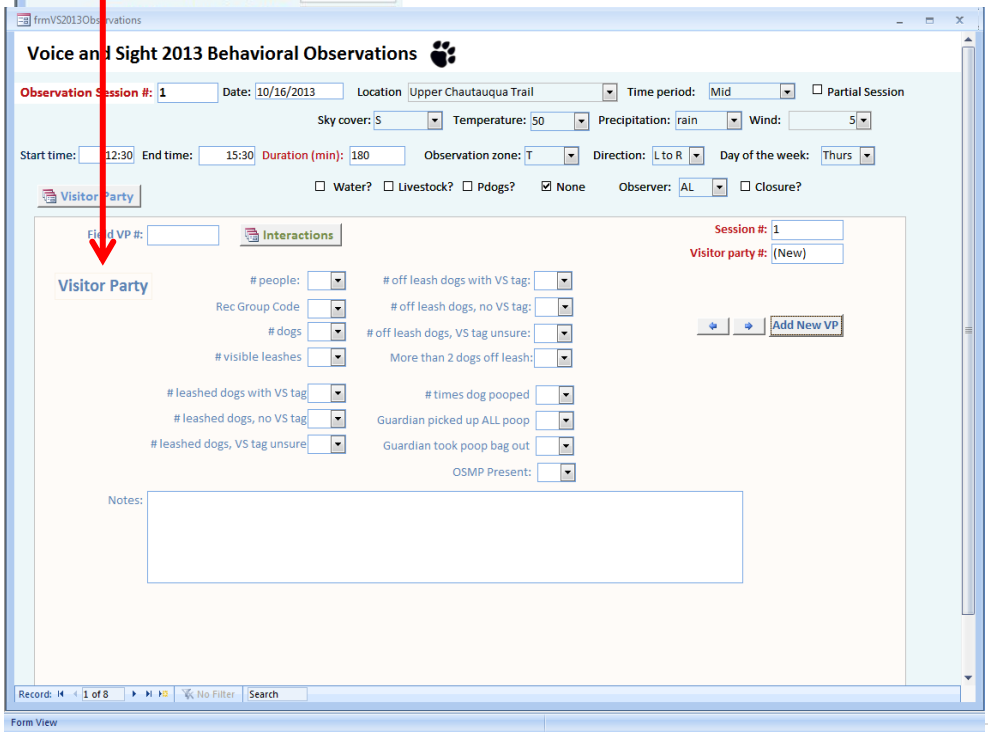
[In Datasheets] On the data sheets, write down the number generated from Observation Session # in Access in the top left hand box of the datasheets labeled "Session ID."

Sub-Form: Visitor Party

[In Access] Click on the "Visitor Party" button to open the visitor party form. A visitor party sub-form (yellow) will pop up on top of the main form (light green).



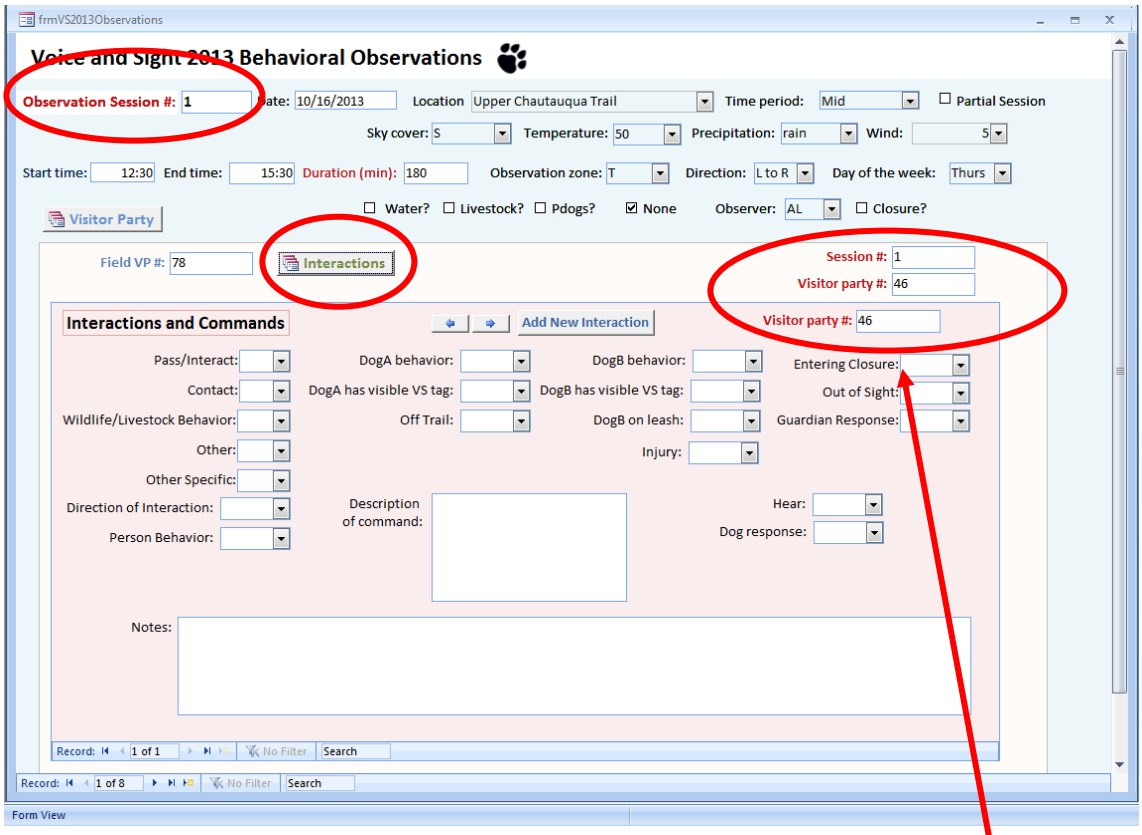
[In Access] When entering visitor party information, check to make sure the Observation Session # on the green form matches the Session # on the yellow form. Make sure you are entering data in a new record (all fields should be blank and Visitor party # should say "(new)"). Use the navigation keys (left arrow, right arrow, "Add New VP") to go to the next record, previous record or add a new record. Reminder: Do NOT enter data in fields (Session #, Visitor party #) marked red. These fields are automatically generated. The Visitor party # will automatically substitute (new) with a number once data has been entered in the other fields or when you leave the record by using the navigation buttons. Begin entering data with "Field VP #." Fill in the rest of the fields by accessing the drop down lists, entering numerical values and entering text. Any number field (e.g. # of dogs, # of people, # of leashes, etc) will allow manual input of numerical values even if the number is not included in the drop down list. To facilitate data entry, the [tab] key can be used to go to the next field without clicking on it with the mouse. The last field for data entry for is "Notes." If there are no notes, write "no notes" in the text box.



[In Datasheets] Write down the number generated from Visitor party # in Access in "Visitor Party Number" on the data sheets.

Sub-Form: Interactions

[In Access] To enter interactions and commands, click on the "Interactions" button at the top of the Visitor Party form. The interactions sub-form (light red) will pop up on top of visitor party (yellow) and observation session (light green).



[In Access] For entering interactions/commands, check to make sure the Visitor party # on the light red form matches the Session # and VP # on the yellow form. Make sure you are entering data in a new record for interactions (all fields in black will be blank). Use the navigation keys (left arrow, right arrow, "Add New Interaction") to go to the next record, previous record or add a new record. Reminder: Do NOT enter data in fields marked red. These fields are automatically generated. If there are no interactions and commands recorded for the visitor party, leave the fields blank and click on the "Interactions" button to close this sub-form. If there are interactions and commands, fill in the fields by accessing the drop down lists and entering text. In the command textbox, if there are no commands to be entered, write "/." You can fill in the fields in any order. Last field for data entry is "Notes." Once you're done entering data for interactions and commands, click on the "Interactions" button to close the form when all the interactions and commands have been entered for the visitor party. Reminder: There is no # field associated with

a pass (e.g. if there are two or more dogs involved in a pass event). Place the # of dogs in the Dog A behavior number field.

Main Form: Behavioral Observations Quality Check

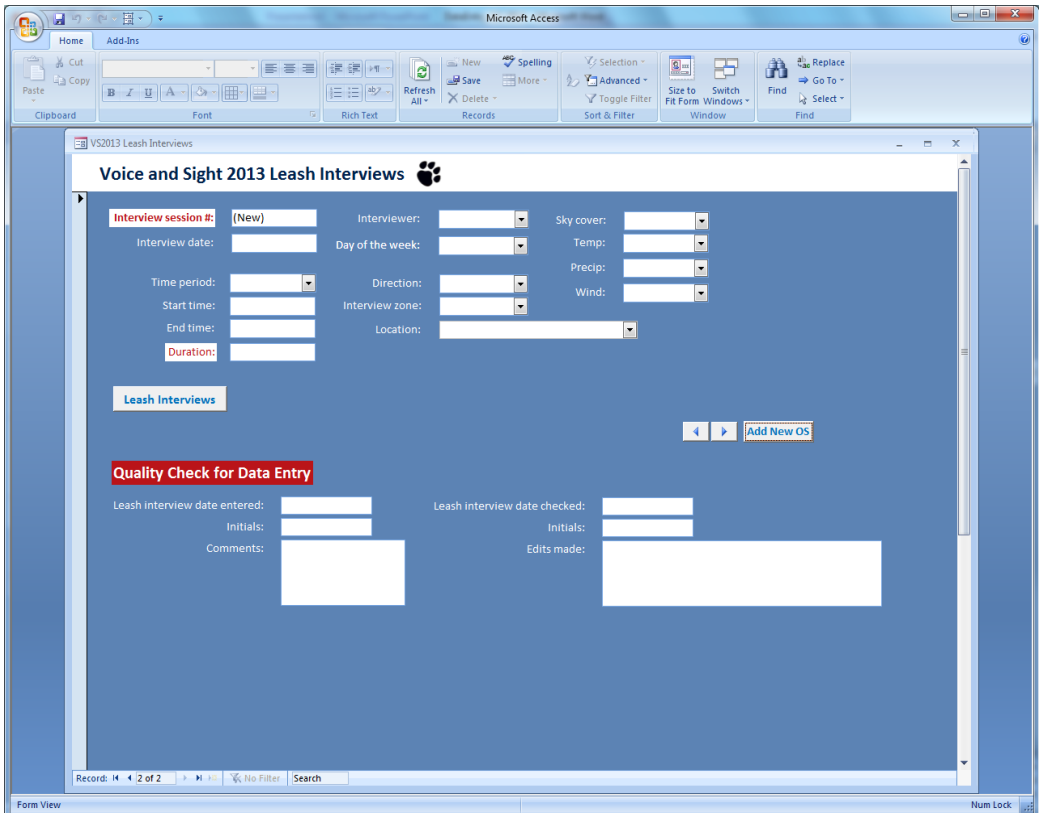
[In Access] Once all the visitor parties have been entered for the observation session, click on "Visitor Party" button to close the sub-form. The main form should be the only form currently opened. Fill in the fields date entered and initials in the section "Quality Check for Data Entry". Write in any comments about entering data for the observation session including any issues with the visitor party and interactions/VS control datasheets.

[In Datasheets] When data entry is complete for Behavioral Observations in Access, turn the datasheets over to the back. Fill in the data entry date, initials and comments. For data entry issues that need resolutions, please place a sticky on the datasheet and describe the problem. Place a colored flag on the top right hand side of the datasheet. Store the datasheets in the folder marked "Attention."

Entering Data for Form: Leash Interviews

Enter data in the following manner: First, input leash interview session information (header fields on top of the datasheet). Then input the leash interview data by clicking on the button "Leash Interviews" to open/close the leash interview sub-form.

Form: Leash Interviews



[In Access] Before entering new leash interview session information, make sure you are entering data in a new record. Use the navigation keys (left arrow, right arrow, "Add New OS") to go to the next record, previous record or add a new record. Clicking on "Add New OS" will automatically generate a new record. In a new record, you should see "(new)" next to Interview Session #. Do not enter anything in Interview session # and duration. These fields (in red) are automatically generated. The Interview session # will automatically substitute (new) with a number once data has been entered in the other fields or when you leave the record by using the navigation buttons. Begin entering data with "Interview Date." Clicking on the date field will produce a calendar icon to the right of the field where you can search for a specific date. Duration will be auto-calculated using the data entered for Start Time and End Time. Enter the other fields by accessing the drop down lists at the top of the form (all fields above the Quality Check for Data Entry). To facilitate data entry, the [tab] key can be used to go to the next field without clicking on it with the mouse.
[In Leash Interview Datasheet] On the data sheet, write down the number generated from Interview session # in Access in the top left hand box of the datasheet labeled "Session ID."

[In Access] Click on the "Leash Interview" button to open the leash interview sub-form. A leash interview visitor party sub-form (yellow) will pop up. For entering leash interview visitor party information, check to make sure the Interview session # on the blue form matches the Interview session # on the yellow form. Make sure you are entering data in a new record. Use the

navigation keys (left arrow, right arrow, "Add New VP") to go to the next record, previous record or add a new record. See Visitor Party # and the field next to it should say "(new)." Reminder: Do NOT enter data in fields marked red. These fields are automatically generated. Begin entering data with "Temp Visitor #" which corresponds to the "Field VP number" on the datasheet. Once the Temp Visitor # has been entered, the Visitor Party # will automatically substitute (new) with a number. Enter the other fields by using the drop down lists. You can enter data in the fields in any order, but to facilitate data entry, the [tab] key can be used to go to the next field without clicking on it. Last field for data entry for this part of the form is "Notes." If there are no notes for the visitor party, write "No notes" in the textbox. Once you're done entering data for leash interview, click on the "Leash Interview" button to close the form when all the visitor parties for the leash interview session have been entered.

[In Leash Interview Datasheet] Write down the number generated from Visitor party # in Access in "Visitor Party Number" on the data sheet. Make sure the Visitor party # and Temp Visitor # combination in the Access database match the Visitor Party Number and Field VP Number on the datasheet.

Main Form: Leash Interviews Quality Check

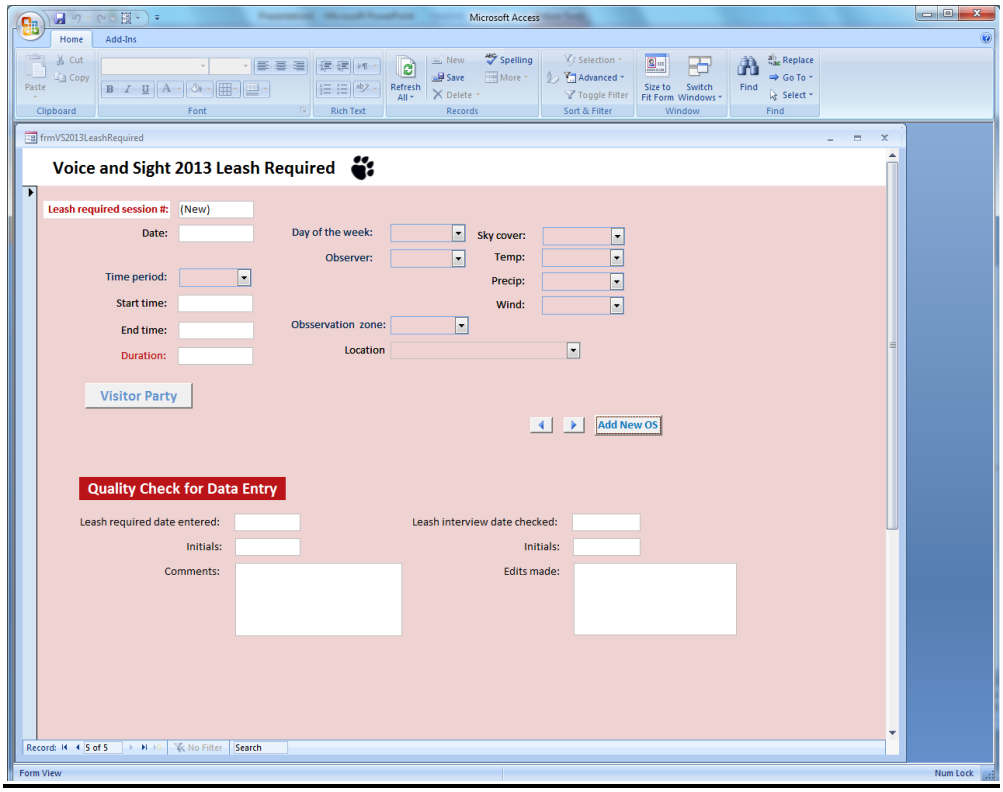
[In Access] Once all the visitor parties have been entered for the leash interview session and the "Leash Interviews" button is clicked to close the form, the "Quality Check" fields will be visible. Enter the date the data was entered and the initials of the person who entered the data. Write in any comments about entering data for the leash interview session including any issues with entering the information in the datasheet.

[In Leash Interview Datasheet] When data entry is complete in Access, turn the datasheet over to the back. Fill in the data entry date, initials and comments. For data entry issues that need resolutions, please place a sticky on the datasheet and describe the problem. Place a colored flag on the top right hand side of the datasheet. Store the datasheets in the folder marked "Attention."

Entering Data for Form: Leash Required

Enter data in the following manner: First, input leash required session information (header fields on top of the datasheet). Then input the leash required data by clicking on the button "Visitor Party" to open/close the leash required sub-form.

Form: Leash Required



[In Access] Before entering new leash required session information, make sure you are entering data in a new record. Use the navigation keys (left arrow, right arrow, "Add New OS") to go to the next record, previous record or add a new record. Clicking on "Add New OS" will automatically generate a new record. In a new record, you should see "(new)" next to Leash required session #. Do not enter anything in Leash required session # and duration. These fields (in red) are automatically generated. The Leash required session # will automatically substitute (new) with a number once data has been entered in the other fields or when you leave the record by using the navigation buttons. Begin entering data with "Date." Clicking on the date field will produce a calendar icon to the right of the field where you can search for a specific date. Duration will be auto-calculated using the data entered for Start Time and End Time. Enter the other fields by accessing the drop down lists at the top of the form (all fields above the Quality Check for Data Entry). To facilitate data entry, the [tab] key can be used to go to the next field without clicking on it with the mouse.

[In Leash Required Datasheet] On the data sheet, write down the number generated from Leash required session # in Access in the top left hand box of the datasheet labeled "Session ID"

[In Access] Click on the "Visitor Party" button to open the leash required visitor party sub-form. A leash required visitor party sub-form (yellow) will pop up. For entering leash required visitor party information, check to make sure the Leash required session # on the light red form matches the Session # on the yellow form. Make sure you are entering data in a new record. Use the

navigation keys (left arrow, right arrow, "Add New VP") to go to the next record, previous record or add a new record. See Visitor Party # and the field next to it should say "(new)." Reminder: Do NOT enter data in fields marked red. These fields are automatically generated. Begin entering data with "Temp Visitor #" which corresponds to the "Field VP number" on the datasheet. Once the Temp Visitor # has been entered, the Visitor Party # will automatically substitute (new) with a number. Enter the other fields by using the drop down lists. You can enter data in the fields in any order, but to facilitate data entry, the [tab] key can be used to go to the next field without clicking on it. Last field for data entry for this part of the form is "Notes." If there are no notes for the visitor party, write "No notes" in the textbox. Once you're done entering data for leash required, click on the "Visitor Party" button to close the form when all the visitor parties for the leash required session have been entered.

[In Leash Required Datasheet] Write down the number generated from Visitor party # in Access in "Visitor Party Number" on the data sheet. Make sure the Visitor party # and Temp Visitor # combination in the Access database match the Visitor Party Number and Field VP Number on the datasheet.

Main Form: Leash Required Quality Check

[In Access] Once all the visitor parties have been entered for the leash required session and the "Visitor Party" button is clicked to close the form, the "Quality Check" fields will be visible. Fill in the fields date entered and initials. Write in any comments about entering data for the leash required session including any issues with the visitor party information for leash required datasheet.

[In Leash Required Datasheet] When data entry is complete in Access, turn the datasheet over to the back. Fill in the data entry date, initials and comments. For data entry issues that need resolutions, please place a sticky on the datasheet and describe the problem. Place a colored flag on the top right hand side of the datasheet. Store the datasheets in the folder marked "Attention."

Quality Check

General Instructions: Check the data in Access against the datasheets line by line on the screen using the Forms. Find discrepancies and make changes to the electronic data. Document changes to datasheets in red ink. Also check data for the specific issues given below. Data should be checked by a person other than the person who performed the original data entry. Please record the date the data was checked, your initials, and any edits or comments you made on the back of the respective datasheets and in the section called "Quality Check for Data Entry" on the main forms in the database. In the edits made field, record the status of the data changes made (e.g. no errors corrected, errors corrected, unresolved errors remain, etc.). Also, describe the type of errors corrected (e.g. changed number of dogs from 2 to 3) and describe any unresolved problems (e.g. can't read observer notes, missing information, need to clarify information with observer, etc.). Any unresolved data problems should also be noted on "stickies" tacked to the

datasheets, flagged with colored tape and reported to Deonne at vanderwouded@bouldercolorado.gov (x2082).

Specific items to check for:

"Session" information entered in Behavioral Observations, Leash Interviews and Leash Required

1. Is there a Session ID?
2. Are all times filled in using 24 hr time (15:30 rather than 3:30)?
3. Partial session box is checked for a session lasting more than 2 hours but less than the required 3 hours.
4. Start time/End time matches AM, Mid-Day or PM
5. Check TH, Start of Trail and Interior matches specific location on attribute table or site list
6. Reminder: Wind speed is an actual number on the datasheet, but in data entry wind is categorical based on the Beaufort scale. Find the wind speed number within the appropriate category.

"Visitor Party" information entered in Behavioral Observations:

1. Are the visitor party numbers (column header in red) filled in?
2. Compare the # of dogs to the columns for tag display. Does the # of dogs match the total number for tag display (when the columns are added).
3. For 0-2 dogs, the more than 2 dogs off-leash column = /
4. For 3+ dogs, the more than 2 dogs off-leash column is either a 1 or 0
5. If the # of poop is 0, then pickup and took columns = /
6. Check the tag display columns (there are 6 columns) – if any of these columns has a "/" change to 0.

"Interactions and VS Control" information entered in Behavioral Observations:

1. Are the headers filled in or checked? Date, Closure, Time Period, Location, Obs Zone and Observer
2. Does the Field VP Number (on this form – beige) match the Field VP Number on the Visitor Party Form (light blue)?
3. If there is a P or I in Pass/Interact and/or a 1, 2 , or 3 in Guardian Response, there should always be a letter in DogA column for reporting Dog A behavior even if the behavior is Z = no behavior observed along with a # indicating the number of dogs in the visitor party under observation participating in an event (one row, one record).
4. For every event recorded, the following cells require a number: DogA tag, Off Trail, Enter Closure, Out of Sight, Guardian Response.

"Leash Interviews" information entered in Leash Interviews:

1. Are the visitor party numbers (column header in red) filled in?
2. Check the tag display columns (there are 6 columns) – if any of these columns has a "/" change to 0.

“Visitor Party” information entered in Leash Required:

1. Are the visitor party numbers (column header in red) filled in?
2. Check the tag display columns (there are 6 columns) – if any of these columns has a “/” change to 0.

Appendix J: GIS data management instructions for data collectors
Reminder: Instructions are in sequential order. Please follow instructions in sequence.

DATA COLLECTION: Using the GPS units
Before heading to the field, check to make sure the listed background files and data dictionaries are in the GPS unit.

Open TerraSync:

- Using the drop down menu for "Status", click on "Map"
- Drop down menu for "Layers", click on "Background Files"
- Listed below are the background files that should show up on the unit
    - ✓ Leash Req 2013 Yellow
    - ✓ VS 2013 Red
    - ✓ VS 2006-2010 Green
    - ✓ VS Int 2013 Pink
    - ✓ VS Int 2006-2010 Blue

Before collecting data, check skyplot "Status" settings. If the numbers below are not listed as settings, make the changes by navigating to the drop down menu for "Status" and click on "GNSS Settings"

- Max PDOP: 6.0
- Min SNR: 33.0 (SNR gets at signal strength)
- Min Elevation: 15° (and elevation at location of satellite compared to the horizon)

Collecting data in TerraSync:

- Using the drop down menu for "Status", click on "Data"
- Check location is "Storage Card"
- Check Dictionary Name is "Monitoring VS 2014"
- Create 1 data file per day; use VSMMDDYY naming convention for file names
- If attributes need changing or observation post is moved to new location, create "Site Name"
- If attributes do NOT change (observation post is NOT moved), but offset or FOV is changing:
    - ➢ Use "Offset" to change offset
    - ➢ Use "Field of View1" "Field of View 2" etc. to change FOV
- Create a generic line to map the trail width; type trail name into comment text box

DATA TRANSFER, CORRECTION & EXPORT: Uploading data from GPS unit using the walk-up computers in GIS lab

Plug in connection cable (GPS unit to computer): connection cables are hanging on the wall behind the printer

*There is a waiting period between collecting data with the GPS unit and making corrections in GIS Pathfinder. Wait one hour after coming back from the field to transfer, correct and export data.

Open GPS Pathfinder:
Select Project, Check project folder is E:\MapFiles\Monitoring\Dogs\\VoiceSight_2013

- **Data Transfer:** Uploading data from GPS unit to computer
  - Under "Utilities", click "Data Transfer"
  - Find files and "Add", then "Transfer all"
- **Data Correction:** Correcting position locations
  - Under "Utilties", click "Differential Correction"
  - Select SSF files to correct (may already be listed or find using the + button)
  - Don't change any of the default values
  - Check the percentages of the output: re-do correction process if higher percentages are present within the 1-2m/2-5m/>5m ranges. Prefer percentages to fall in the ranges below 1m.
- **Export:** Transferring corrected data to project folder
  - Under "Utilities," click "Export"
  - Check output folder is E:\MapFiles\Monitoring\Dogs\\VoiceSight_2013\Export
  - Check default export setup is "Sample ESRI Shapefile Setup"
  - Check GIS Coordinate System has the following settings (ask Kathy for help to change these settings if needed):
    - System: US State Plane 1983
    - Zone: Colorado North 0501
    - Datum: NAD 1983 (Conus)
    - Coordinate Units: Feet

Exit GIS Pathfinder

DATA ORGANIZATION: Ensuring files in project folder do not get overwritten

Open ArcCatalog:

- Navigate to project folder E:\MapFiles\Monitoring\Dogs\\VoiceSight_2013
- Rename shapefiles based on the following label convention:
  - MMDDYY_FOV
  - MMDDYY_Offset
  - MMDDYY_SiteNam
  - MMDDYY_Twidth

DATA VERIFICATION and EDITING: Checking to make sure data is uploaded correctly and making edits to attribute tables if necessary

Open E:\MapFiles\Monitoring\Dogs\\VoiceSight_2013\Maps\VoiceAndSight_Working10_DV

For verifying and editing data:

- Find on the toolbar a symbol of a + overlayed on a yellow diamond, click and "Add Data"
- Grab the shapefiles. These will be imported into map as new layers
- Right-click on the layers you just imported and click "Open Attribute Table"
- Check to make sure the attributes have been imported correctly
- If edits need to be made, find the editor toolbar

- Using the drop down menu “Editor”, click “Start editing”
- Make the edits in the attribute tables and click “Save edits” frequently
- When edits are complete, save and click “Stop editing”

- Remove new layers from Table of contents, right-click and hit “Remove”

DATA MANAGEMENT: Organizing files in project folder

Close ArcCatalog, ArcMap and GIS Pathfinder
Open Explorer

- Navigate to project folder E:\MapFiles\Monitoring\Dogs\\VoiceSight_2013\
- In this main project folder are files that need to placed in respective sub-folders
- Find raw and corrected files
  - Corrected files have a “bulls-eye” icon followed by the “VSMMDDYY” naming convention
  - Raw files have an icon with a cross overlayed on a turquoise circle followed by the “VSMMDDYY” naming convention
- Open “GPS” folder and place raw and corrected files in respective sub-folders “RawData” and “CorrectedData”
- Place the rest of the files in respective sub-folders by navigating to “Export” folder, then “2014” folder
  - File names will match the folder names
    - Files labeled with MMDDYY_FOV are placed in the folder “Field_of”
    - Files labeled with MMDDYY_Offset are placed in the folder “Offset”
    - Files labeled with MMDDYY_SiteNam are placed in the folder “SiteNam”
    - Files labeled with MMDDYY_Twidth are placed in the folder “Trail_width”
    - Place all text files in the “Text” folder

THE END.